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# SPORT FISHERY ABSTRACTS

Vol. 27, No. 1, 1982

DEPARTMENT OF THE INTERIOR
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UNITED STATES DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE

# SPORT FISHERY ABSTRACTS

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*Sport Fishery Abstracts* is intended to furnish fishery biologists with abstracts of current literature in sport-fishery research and management.

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# SPORT FISHERY ABSTRACTS

**An abstracting service for fishery research and management**

Volume 27 Number 1 1982

## CONTENTS

AQUATIC PLANTS AND THEIR CONTROL .......... 1

CULTURE AND PROPAGATION

General Fish Culture .......... 1
Trout and Salmon Culture .......... 2
Other Andromous Species Culture .......... 3
Warmwater Culture .......... 3
Mariculture .......... 4
Feeds, Feeding and Nutrition .......... 5
Transporting Fish .......... 6

LIMNOLOGY AND OCEANOGRAPHY

General .......... 6
Chemical .......... 6
Benthos .......... 7
Plankton .......... 7

MORPHOLOGY, PHYSIOLOGY, GENETICS AND BEHAVIOR

Morphology .......... 7
Physiology .......... 11
Genetics, Variation Studies, Hybridization .......... 21
Behavior .......... 23

NATURAL HISTORY

Life Histories - General Works .......... 27
Population Studies - Production, Standing Crop, Recruitment. 30
Spawning Habits and Movements, Sex Ratios, Fecundity, etc... 32
Movements, Seasonal and Depth Distribution, etc. .......... 35
Foods and Feeding .......... 36
Age and Growth .......... 39
Geographical Distribution, Fish surveys, etc. .......... 42
Abundance, Factors of; Survival and Mortality .......... 45
Identification, Keys, Classification .......... 46

PARASITES AND DISEASES

General .......... 49
Bacterial .......... 49
Protozoan .......... 50
Other .......... 51

POLLUTION AND TOXICOLOGY

Pollution .......... 53
Fish Kills .......... 56
Toxicology; Bioassays .......... 57
Fish Toxicants .......... 59

RESEARCH AND MANAGEMENT

General .......... 60
Administration and Planning .......... 60
Reports of Fishery Stations, States, etc. .......... 60
Habitat Alterations .......... 61
Harvest, Creel Census, etc. .......... 61
Regulations .......... 61
Fish Control and Removal .......... 62
Marking and Tagging .......... 62
Stocking and Introductions .......... 62
Fishing Gear and Techniques .......... 63
Fertilization of Water and Soil .......... 64
Fishways, Fish Passage through Dams, etc. .......... 64
Mathematical, Statistical Methods and Modeling .......... 65
Lake Management and Research .......... 65
River and Stream Management and Research .......... 66
Farm Pond and Small Impoundment Management and Research .... 66
Large Impoundment Management and Research .......... 66
Estuary Management and Research .......... 67
Marine Management and Research .......... 67
Utilization of Fishery Products .......... 67
Miscellaneous Techniques and Equipment .......... 68
Reviews, Bibliographies, etc. .......... 68

AUTHOR INDEX (Salmon) .......... 69
GEOGRAPHIC INDEX (Yellow) .......... 85
SYSTEMATIC INDEX (Blue) .......... 89

## AQUATIC PLANTS AND THEIR CONTROL

82-000001 Shireman, J. V. and M. J. Maceina. THE UTILIZATION OF GRASS CARP, *CTENOPHARYNGODON IDELLA* VAL., FOR HYDRILLA CONTROL IN LAKE BALDWIN, FLORIDA. *J. Fish Biol.* 19(6):629-636. Dec. 1981. SFA 27(1)

[Sch. For. Resour. Conserv., Univ. Fla., Gainesville] Grass carp, *Ctenopharyngodon idella*, >300 mm t.l. were stocked in Lake Baldwin, Florida during 1978 (24 fish $ha^{-1}$) to evaluate their effectiveness for hydrilla control. Hydrilla, *Hydrilla verticillata*, was nearly eradicated from Lake Baldwin 2 years after stocking. Control was effective with 130 kg grass carp $ha^{-1}$ of hydrilla and control was definite when biomass exceeded 185 kg $ha^{-1}$ of hydrilla. Grass carp growth was rapid during the first two years as fish reached 9·17 kg by June 1980. Grass carp >6kg consumed 25-28% of their body weight of hydrilla per day. The use of grass carp for vegetation management is discussed.

## GENERAL FISH CULTURE

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[Inst. Zooprof. Sper. Piemonte, Liguria e Valle d'Aosta - Via Bologna, 148-10154 Torino, Italy]

82-000003 Jagoe, C. J.; D. P. Small; R. L. Blake; S. Woodward; D. C. Smith and J. R. Moring. COMMERCIAL AQUACULTURE OF FISHES IN MAINE: STATUS AND FUTURE PROSPECTS. *Fisheries (Bull. Am. Fish. Soc.)* 6(5):16-24. Sept.-Oct. 1981. SFA 27(1)

[Migratory Fish Res. Inst., Dep. Zool., Univ. Me., Orono 04469]

82-000004 Shang, Y. C. A COMPARISON OF REARING COSTS AND RETURNS OF SELECTED HERBIVOROUS, OMNIVOROUS, AND CARNIVOROUS AQUATIC SPECIES. *Mar. Fish. Rev.* 43(9):23-24. Sept. 1981. SFA 27(1)

[Dep. Agric. Resour. Econ., Univ. Hawaii, Honolulu 96822]

82-000005 Zolotnitskiy, A. P. SOME DATA ON THE GONADOTROPIC ACTIVITY OF THE HYPOPHYSIS IN THE BLACK SEA TURBOT *SCOPHTHALMUS MAEOTICUS* IN CONNECTION WITH STORAGE TIMES. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 20(5):160-162. 1980. SFA 27(1)

[AzCherNIRO, Kerch, USSR] The data obtained indicate that with long storage a decrease occurs in the gonadotropic activity of the hypophyses, which must be taken into account when calculating the doses of hypophyseal material earmarked for inducing the maturation and spawning of spawners. Since the times for collection of the hypophyses of the Black Sea turbot are restricted, glands kept for a long time (up to 5 years) can be used in addition to freshly prepared ones for fisheries purposes. The collection and storage of hypophyses must necessarily be carried out differentially, according to the sex of the fish.--From text.

## TROUT AND SALMON CULTURE

82-000006 Allen, W. V. and G. H. Allen. AMINO ACIDS IN THE FOOD WEB OF A WASTEWATER AQUACULTURE SYSTEM FOR REARING JUVENILE SALMON. *Prog. Fish.-Cult.* 43(4):178-182. Oct. 1981. SFA 27(1)
[Biol. Dep., Humboldt State Univ., Arcata, CA 95521]

82-000007 Donaldson, E. M.; G. A. Hunter and H. M. Dye. INDUCED OVULATION IN COHO SALMON (*ONCORHYNCHUS KISUTCH*). III. PRELIMINARY STUDY ON THE USE OF THE ANTIESTROGEN TAMOXIFEN. *Aquaculture* 26(1-2):143-154. Nov. 1981. SFA 27(1)
[Dep. Fish. Oceans, 4160 Marine Dr., West Vancouver, BC V7V 1N6, Canada]

82-000008 Donaldson, E. M.; G. A. Hunter and H. M. Dye. INDUCED OVULATION IN COHO SALMON (*ONCORHYNCHUS KISUTCH*). II. PRELIMINARY STUDY OF THE USE OF LH-RH AND TWO HIGH POTENCY LH-RH ANALOGUES. *Aquaculture* 26(1-2):129-141. Nov. 1981. SFA 27(1)
[Dep. Fish. Oceans, 4160 Marine Dr., West Vancouver, BC V7V 1N6, Canada]

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82-000010 Peñáz, M. and J. Příhoda. REPRODUCTION AND EARLY ONTOGENY OF *HUCHO HUCHO*. *Acta Sci. Nat. Brno* 15(6):1-33. 1981. In English with Russian summ. SFA 27(1)

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[Inst. Mar. Res., Matre Aquacult. Stn., Matredal, Norway]

82-000012 Whoriskey, F. G.; R. J. Naiman and W. L. Montgomery. EXPERIMENTAL SEA RANCHING OF BROOK TROUT, *SALVELINUS FONTINALIS* MITCHILL. *J. Fish Biol.* 19(6):637-651. Dec. 1981. SFA 27(1)
[R. J. Naiman: Woods Hole Oceanographic Inst., Woods Hole, MA 02543] An experiment to induce anadromy in a populaton of wild brook trout, *Salvelinus fontinalis*, was conducted near Sept-Iles, Quebec, in 1978-1979. Brook trout were captured from the Matamek River, tagged and transported to the Matamek River estuary during late spring and early summer, and allowed free movement between an impassable waterfall 0·7 km upstream and the sea. Fish were recaptured in autumn as they returned to fresh water. Over two years, 34·0% of the released fish were recaptured. Best returns were in the 2+ and 3+ age classes with 38·0 and 62·1% recaptured, respectively. Straying of transplanted fish appeared to be <1%. All age classes included sea run brook trout (sea trout) but the largest percentages of sea trout occurred in older fish. Growth was better in sea trout than in fish which did not develop anadromy, presumably a function of an increased food supply at sea. Severe tagging effects stunted growth and probably suppressed anadromy, especially among younger fish. Sexual characteristics of recaptured fish indicted supressed maturation of gonads in sea trout compared to fish remaining in fresh water and there was a shift to a larger percentage of females in the sea trout. Comparisons between our results and data on

## TROUT AND SALMON CULTURE (CONTINUED)

82-000012 CONTINUED other anadromous *Salvelinus* species underscore the potential for sea ranching of trout and char as moderate effort, high yield aquaculture technique.

## OTHER ANADROMOUS SPECIES CULTURE

82-000013 Braid, M. R. and E. W. Shell. INCIDENCE OF CANNIBALISM AMONG STRIPED BASS FRY IN AN INTENSIVE CULTURE SYSTEM. *Prog. Fish.-Cult.* 43(4):210-212. Oct. 1981. SFA 27(1)
[Dep. Biol., Univ. Montevallo, Montevallo, AL 35115]

82-000014 Woods, L. C. III; J. H. Kerby; M. T. Huish; G. M. Gafford and W. L. Rickards. CICULAR TANK FOR INTENSIVE CULTURE OF HYBRID STRIPED BASS. *Prog. Fish.-Cult.* 43(4):199-200. Oct. 1981. SFA 27(1)
[N.C. Coop. Fish. Res. Unit, N.C. State Univ., Raleigh 27650]

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[Miss. Agric. For. Exp. Stn., Mississippi State 39762]

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[U.S. FWS, Willow Beach Natl. Fish Hatchery, P.O. Box 757, Boulder City, NV 89005]

82-000018 Kemp, A. REARING OF EMBRYOS AND LARVAE OF THE AUSTRALIAN LUNGFISH, *NEOCERATODUS FORSTERI*, UNDER LABORATORY CONDITIONS. *Copeia* 1981(4):776-784. 29 Dec. 1981. SFA 27(1)
[Queensland Mus., Fortitude Valley, Queensland 4006, Australia]

82-000019 Li, S. and G. B. Ayles. PRELIMINARY EXPERIMENTS ON GROWTH, SURVIVAL, PRODUCTION AND INTERSPECIFIC INTERACTIONS OF WALLEYE (*STIZOSTEDION VITREUM VITREUM*) FINGERLINGS IN CONSTRUCTED EARTHEN PONDS IN THE CANADIAN PRAIRIES. *Can. Tech. Rep. Fish. Aquatic Sci.* No. 1041. iv + 14p. Dec. 1981. In English with French summ. SFA 27(1)
[West Reg., Dep. Fish. Oceans, Winnipeg, MB R3T 2N6, Canada] Rearing of walleye fry and fingerlings in ponds can decrease the normally very high mortalities in larger water bodies. Subsequent release into natural waters of large fingerlings may ultimately lead to an increase of catchable fish. An experiment on extensive rearing of walleye was conducted in 4 constucted earthen ponds and 12 farm dugouts in the Canadian prairies. Growth was good: with 112-140 days of growth, walleye attained 102-164 mm with a mean of 134 mm in length and 7.5 - 32.9 g with a mean of 19.6 g in weight. Survival generally was low. The survival in 11 ponds in which fish were not killed by environmental factors ranged from 1.2 to 18% with a mean of 7.6%, and

## WARMWATER CULTURE (CONTINUED)

82-000019 CONTINUED correspondingly, the production of walleye in the 11 ponds ranged from 0.5 to 36.4 kg/ha with a mean 13.3 kg/ha. Carp and minnows were also stocked in the ponds but their effects on the walleye were not significant.

82-000020 Li, S. and G. B. Ayles. AN INVESTIGATION OF FEEDING HABITS OF WALLEYE (*STIZOSTEDION VITREUM VITREUM*) FINGERLINGS IN CONSTRUCTED EARTHEN PONDS IN THE CANADIAN PRAIRIES. *Can. Tech. Rep. Fish. Aquatic Sci.* No. 1040. iv + 10p. Dec. 1981. In English with French summ. SFA 27(1)
[West. Reg., Dep. Fish. Oceans, Winnipeg, MB R3T 2N6, Canada] Stomach contents from 757 walleye (*Stizostedion vitreum vitreum*) fingerlings ranging in length from 34 to 177 mm stocked in 11 constructed ponds were analyzed. The food items found in walleye stomachs were categorized as follows: preferred - mayflies, *Chaoborus*, *Gammarus*, fish; common - crustaceans, leeches; and rare - chironomids and water boatmen. Zooplankton were heavily utilized by small fish while fish were important only for the larger fingerlings. Fullness index and feeding intensity varied with season. July-August were periods of peak feeding activities. There was a significant multiple correlation ($n=17$, $r=0.69$, $p < 0.01$; $G = -82.71 + 3.65 F_I - 0.12 K_F$) between absolute growth rate and feeding intensity and fullness index. Recommendations are made for the improvement of walleye culture by providing approximate food at approximate times.

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[Appl. Ecol. Res. Group, Dep. Life Sci., Polytech. Cent. London, 115 New Cavendish St., London W1M 8JS, England]

82-000022 Singh, S. P.; J. C. Malhotra; R. N. Seth; K. P. Srivastava and K. Chandra. OBSERVATIONS ON REARING OF HATCHLINGS OF CATFISH *MYSTUS SEENGHALA* (SYKES). *Aquaculture* 26(1-2):161-166. Nov. 1981. SFA 27(1)
[Cent. Inland Fish. Res. Substn., 24 Pannalal Rd., Allahabad, U.P.-211 002, India]

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[Lab. Biol. Mar. Pesca-Viale Adriatico, 52-61 032 FANO (PS), Italy]

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[Waikiki Aquarium, Honolulu, HI]

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[Vancouver Publ. Aquarium, P.O. Box 3232, Vancouver, BC V6B 3X8, Canada]

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[Fish. Res. Div., Minist. Agric. Fish., Private Bag, Christchurch, New Zealand]

## FEEDS, FEEDING, AND NUTRITION

82-000028 Grabner, M.; W. Wieser and R. Lackner. THE SUITABILITY OF FROZEN AND FREEZE-DRIED ZOOPLANKTON AS FOOD FOR FISH LARVAE: A BIOCHEMICAL TEST PROGRAM. *Aquaculture* 26(1-2):85-94. Nov. 1981. SFA 27(1)
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[Iowa Coop. Fish Res. Unit, Science Hall II, Iowa State Univ., Ames 50011]

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[Dep. Biol., Subdep. Anim. Physiol., Wilhelm Pieck Univ., 25 Rostock, West Germany]

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[U.S. FWS, Natl. Fish. Res. Dev. Lab., Wellsboro, PA 16901]

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[Inst. Hydrol., Acad. Sin., Wuhan, China]

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[Vancouver Publ. Aquarium, P.O. Box 3232, Vancouver, BC V6B 3X8, Canada]

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[Washington, DC]

82-000035 Tacon, A. G. J. SPECULATIVE REVIEW OF POSSIBLE CAROTENOID FUNCTION IN FISH. *Prog. Fish.-Cult.* 43(4):205-208. Oct. 1981. SFA 27(1)
[Inst. Aquacult., Univ. Stirling, Stirling FK9 4LA, Scotland]

## FEEDS, FEEDING, AND NUTRITION (CONTINUED)

82-000036 Viola, S.; U. Rappaport; Y. Arieli; G. Amidan and S. Mokady. THE EFFECTS OF OIL-COATED PELLETS ON CARP (*CYPRINUS CARPIO*) IN INTENSIVE CULTURE. *Aquaculture* 26(1-2):49-65. Nov. 1981. SFA 27(1)
[Isr. Feedmills Assoc., Beitan Aharon, Doar Kfar Witkin, Israel] A pelleted basal ration of 25% protein was spray-coated with oils of different origin -plant, chicken or fish, and fed to carp in experimental ponds and cages for 4-7 weeks. Acid oils and neutral oils were utilized equally well, except crude cottonseed oil. Carp grew normally on less than 0.5%ω:3 fatty acids. Five percent oils increased yields in cages by 30-50%, and in ponds by 18%. Feed conversions were improved proportionally. Oiled pellets maintained growth rates and feed conversions at twice the stocking rate of the standard pellets. Protein retention and energy retention were increased; the marginal retention of energy due to the added oil exceeded 100% in several trials (increment of retained energy due to added oil ÷ increment of energy due to feed). The fat content of the carp was raised by 2% on average. The pattern of the body fatty acids tended to change in direction of the dietary oils, i.e. toward higher unsaturation.

82-000037 Yananda, S.; Y. Tanaka and T. Katayama. FEEDING EXPERIMENTS WITH CARP FRY FED AN AMINO ACID DIET BY INCREASING THE NUMBER OF FEEDINGS PER DAY. *Bull. Jpn. Soc. Sci. Fish.* 47(9):1247. Sept. 1981. SFA 27(1)
[Lab. Mar. Biochem., Fac. Fish., Kagoshima Univ., 50-20 Shimoarata-4, Kagoshima 890, Japan]

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[Scripps Aquarium-Mus., La Jolla, CA]

82-000039 Hamman, R. L. TRANSPORTING ENDANGERED FISH SPECIES IN PLASTIC BAGS. *Prog. Fish.-Cult.* 43(4):212-213. Oct. 1981. SFA 27(1)
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## GENERAL LIMNOLOGY AND OCEANOGRAPHY

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[Natl. Water Res. Inst., Inland Waters Dir., Vancouver, BC, Canada]

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[Dep. Zool., Univ. N.C., Chapel Hill 27514]

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[Cent. Wetland Resour., La. State Univ., Baton Rouge 70803]

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[Zool. Dep., Univ. Natal, P.O. Box 375, Pietermaritzburg 3200, Natal, South Africa]

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[Dep. Biol., Univ. New Brunswick, Bag Serv. No. 45111, Fredericton, NB E3B 6E1, Canada]

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[Dep. Avian Aquatic Anim. Med., N.Y. State Coll. Vet. Med., Cornell Univ., Ithaca 14853]

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[Dep. Vet. Anat., Univ. Nigeria, Nsukka, Nigeria]

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[Dep. Zool., N.C. State Univ., Raleigh 27650] The temperature tolerance and resistance times of postlarval (<25mmSL) and small juvenile spot, *Leiostomus xanthurus*, from the Cape Fear Estuary, North Carolina were tested in the laboratory. Critical thermal maximum techniques were used to determine first equilibrium loss (FEL) and critical thermal maximum (CTM)

## PHYSIOLOGY (CONTINUED)

82-000107 CONTINUED ends points and thermal shock methods were used to determine 96-h upper incipient lethal temperatures ($LT_{50}$). Acclimation temperatures ranged from 10 to 35°C and acclimation salinities were 10, 20 and 30°/oo. A quadratic model was fit to the CTM and FEL data; $r^2$ values were 0.924 and 0.928 respectively. Acclimation salinity, estimated weight, acclimation salinity by acclimation temperature interaction and acclimation temperature by estimated weight interaction were the significant components of the CTM model. Predicted CTM values ranged from 30°C at 10°C and 30°/oo acclimation to just over 40°C at 30°C and 30°/oo acclimation. Acclimation temperature, acclimation temperature squared, estimated weight and acclimation temperatures by estimated weight interaction were the significant components of the FEL model. Predicted FEL values ranged from around 28°C at 10°C and 10 °/oo acclimation to about 39°C at 30°C and 30°/oo acclimation. The 96-h $LT_{50}$ values of spot acclimated to 20°/oo increased linearly with acclimation temperature to 25°C. From about 25 to 35°C, $LT_{50}$ values increased very little with acclimation temperature. The ultimate upper incipient lethal temperature of postlarval and small juvenile spot was estimated at 35.2°C. Increased salinity increased resistance time but decreased $LT_{50}$ estimates. Thermal shock tests were better for predicting the effects of thermal addition than were CTM tests.

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[Ichthyol. Fac. Moscow Univ., USSR] It is demonstrated that the electrophoretically separable allelic forms of cod hemoglobin differ in their capacity to combine oxygen at different temperatures. The occurrence of hemoglobin alloforms in cod populations corresponds to temperature conditions in the areas concerned. Hemoglobin polymorphism is of a selective nature.

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[I. A. Johnston: Dep. Physiol., Bute Med. Bldg., St. Andrews Univ., St. Andrews, Fife KY16 9TS, Scotland]

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[Dep. Ecol. Zool., Univ. Umea, Sweden] Length-distribution and growth-patterns of hatchery-reared Baltic salmon parr (*Salmo salar* L.), offspring of crossbreedings of wild and hatchery-reared salmon, were studied at the Norrfors hatchery in northern Sweden (63°50'N, 20°05'E). The size-distribution was unimodal, and no sex differences were seen until the end of the second summers growth. At the end of the second summer when fish were in the age 1+, about 50% of the males became precociously mature and retarded in growth. However, at the onset of maturation precocious males did not differ in size, either from immature males or from females. Males ripening for the first time as 2+ became retarded in growth in the same manner as earlier precosiously maturing males (1+). Females remained immature throughout the experiment. Thus three categories with different size distributions could be distinguished in the three-summer old salmon parr population. It is stated that genetic factors rather than relative size determine year of precocity of an age-class in Baltic salmon.

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82-000165 Krylova, V. D. MORPHOMETRIC CHARACTERISTICS OF A HYBRID BETWEEN THE BELUGA, *HUSO HUSO*, AND THE SEVRYUGA, *ACIPENSER STELLATUS*. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 20(6):89-97. 1980. SFA 27(1)
[VNIRO, Moscow, USSR]

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[Minist. Agric. Fish. Food, Dir. Fish. Res., Fish. Lab., Lowestoft, Suffolk NR33 0HT, England]

82-000167 Luempert, L. G. III. GENETIC SOURCES OF VARIATION IN WEIGHT AND SURVIVAL OF BROOK TROUT (*SALVELINUS FONTINALIS*). *Ph.D. dissertation, N.C. State Univ.* 57p. 1981. From Diss. Abstr. Int. B Sci. Eng. 42(5):1751. Nov. 1981. SFA 27(1)

82-000168 Ráb, P. KARYOTYPE OF EUROPEAN CATFISH *SILURUS GLANIS* (SILURIDAE, PISCES), WITH REMARKS ON CYTOGENETICS OF SILUROID FISHES. *Folia Zool.* 30(3):271-286. 1981. In English with Russian summ. SFA 27(1)
[Inst. Anim. Physiol. Genet., Dep. Genet., Czech. Acad. Sci., Liběchov, Czechoslovakia] The karyotype of the European catfish *Silurus glanis* from southern Bohemia was examined. The diploid chromosome number was 2n=60 in all juvenile specimens examined. The karyotype of *Silurus glanis* comprised 14 pairs of metacentric, 13 pairs of submetacentric and 3 pairs of subtelocentric chromosomes forming the NF value of 120. The chromosome pair No. 1 was satellited, the NOR (nucleolar organizer region) is probably localized in the satellited region of this chromosome pair. The present status of the cytogenetics of siluroid fishes is briefly reviewed to point out the complicated mode of the ploidy and chromosomal evolution within the suborder *Siluroidei*.

82-000169 Ráb, P. KARYOTYPE OF EUROPEAN MUDMINNOW, *UMBRA KRAMERI*. *Copeia* 1981(4):911-913. 29 Dec. 1981. SFA 27(1)
[Inst. Anim. Physiol. Genet., Dep. Genet., Czech. Acad. Sci., 277 21 Liběchov, Czechoslovakia]

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[Lab. Gen. Biol., Univ. Thessaloniki, Greece]

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## GENETICS, VARIATION STUDIES AND HYBRIDIZATION (CONTINUED)

82-000171 CONTINUED *(Engl. Transl. Vopr. Ikhtiol.)* 20(6):37-44. 1980. SFA 27(1)
[A. N. Severtsov Inst. Evol. Morphol. Anim. Ecol., USSR Acad Sci., Moscow, USSR]

82-000172 Wolters, W. R. TRIPLOIDY IN CHANNEL CATFISH, *ICTALURUS PUNCTATUS*. *Ph.D. dissertation, Purdue Univ.* 60p. 1981. From Diss. Abstr. Int. B Sci. Eng. 42(5):1688. Nov. 1981. SFA 27(1)

82-000173 Yamazoe, Y. COMPARATIVE ELECTROPHEROGRAMS OF MUSCLE PROTEINS OF AMPHIBIOUS FISHES. *Bull. Jpn. Soc. Sci. Fish.* 47(8):1047-1049. Aug. 1981. SFA 27(1)
[Dep. Food Nutr., Nagasaki Women's Junior Coll., Yayoi, Nagasaki 850, Japan]

## BEHAVIOR

82-000174 Albrecht, H. ASPECTS OF SOUND COMMUNICATION IN SOME CARIBBEAN REEF FISHES (*EUPOMACENTRUS* SPEC., PISCES: POMACENTRIDAE). *Bijdr. Dierkd.* 51(1):70-80. 1981. SFA 27(1)
[Lab. Anim. Behav., Univ. Amsterdam, The Netherlands] Four species of sympatric damselfishes (*Eupomacentrus*, Pomacentridae) from certain Florida reefs can be distinguished by certain sound characteristics used during courtship. Apparently the fish use these characteristics for species recognition. These characteristics involve the temporal structure of a sound, i.e. the length of the pulse interval, containing the necessary code for communication. In Curaçao members of the same species did not use the same sound characteristics for species recognition as in Florida. Strangely enough, some were able to differentiate between local congeners, but unable to recognize members of their own species. The question arises whether local dialects are in different codes, in different parts of the species' distribution range. These populations could live in local restricted areas, as recordings from one species suggest. It is possible that apart from the temporal structure, the frequency spectrum carries important information for the identification of the species in question. This contradicts earlier conclusions.

82-000175 Blaxter, J. H. S.; J. A. B. Gray and E. J. Denton. SOUND AND STARTLE RESPONSES IN HERRING SHOALS. *J. Mar. Biol. Assoc. U.K.* 61(4):851-869. Nov. 1981. SFA 27(1)
[Dunstaffnage Mar. Res. Lab., Oban, Scotland]

82-000176 Blaxter, J. H. S. and D. E. Hoss. STARTLE RESPONSE IN HERRING: THE EFFECT OF SOUND STIMULUS FREQUENCY, SIZE OF FISH AND SELECTIVE INTERFERENCE WITH THE ACOUSTICO-LATERALIS SYSTEM. *J. Mar. Biol. Assoc. U.K.* 61(4):871-879. Nov. 1981. SFA 27(1)
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82-000177 Calhoun, S. W.; T. L. Beitinger and E. G. Zimmerman. SIMILARITY IN SELECTED TEMPERATURES OF TWO ALLOPATRIC POPULATIONS OF BLACKTAIL SHINER, *NOTROPIS VENUSTUS* (CYPRINIDAE). *Southwest. Nat.* 26(4):441-442. 20 Nov. 1981. SFA 27(1)
[Dep. Biol., Tex. A&M Univ., College Station 77843]

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82-000178 Colton, D. E. and W. S. Alevizon. DIURNAL VARIABILITY IN A FISH ASSEMBLAGE OF A BAHAMIAN CORAL REEF. *Environ. Biol. Fishes* 6(3-4):341-345. 1 Nov. 1981. SFA 27(1)
[Dep. Biol. Sci., Fla. Inst. Technol., Melbourne 32901] Variation in the diurnal composition of a fish assemblage of a Bahamian coral reef was investigated by comparing visual counts of fishes taken along a 100 x 4 m wide fixed transect at four times: 0900, 1200, 1500 and 1800 hours during the summer of 1979. One sample per day was obtained at each time period over a span of 20 consecutive days. Forty-two species were recorded in these samples, with 25 occurring frequently enough to permit statistical analysis of diurnal variations in abundance. Of the 25 species compared, nearly one fourth (6 species) displayed significant variation in abundance patterns among the four time periods tested. It is suggested, because of the strong possiblity of bias which might otherwise be introduced because of these variations, that repetitive quantitative visual censusing of coral reef fishes be undertaken at about the same time each day.

82-000179 Day, M. H., (ed.). VERTEBRATE LOCOMOTION. *Symp. Zool. Soc. Lond.* no. 48. xvii + 471p. 1981. SFA 27(1)
[Dep. Anat., St. Thomas's Hosp. Med. Sch., London, England]

82-000180 De Martini, E. E. and J. A. Coyer. CLEANING AND SCALE-EATING IN JUVENILES OF THE KYPHOSID FISHES, *HERMOSILLA AZUREA* AND *GIRELLA NIGRICANS*. *Copeia* 1981(4):785-789. 29 Dec. 1981. SFA 27(1)
[Univ. Calif., 533 Stevens Ave., Solana Beach 92075]

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[Ist. Zool., Univ. Firenze, Italy]

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[Dep. Fish. Wildl., Mich. State Univ., East Lansing 48824]

82-000183 Flanagan, C. A. FOURIER MORPHOMETRICS OF REEF FISHES OF THE GULF OF CALIFORNIA. *Ph.D. dissertation, Univ. Ariz.* 176p. 1981. From Diss. Abstr. Int. B Sci. Eng. 42(6):2204. Dec. 1981. SFA 27(1)

82-000184 Helfman, G. S. TWILIGHT ACTIVITIES AND TEMPORAL STRUCTURE IN A FRESHWATER FISH COMMUNITY. *Can. J. Fish. Aquatic Sci.* 38(11):1405-1420. Nov. 1981. SFA 27(1)
[Zool. Dep., Univ. Ga., Athens 30602]

82-000185 Inoue, M.; H. Yatomi; M. Aoki; S. Ooga; T. Utida and A. Miyashita. [STUDIES ON DOMESTICATON AND EXTENSIVE BREEDING OF SKIPJACK, TUNAS AND OTHER FISHES--III. BEHAVIOUR OF SOME "FOLLOWING", AND SHORT HOMING BEHAVIOUR OF THE SCOMBRIDAE AND THE CARANGIDAE DOMESTICATED IN FISH PRESERVE (ARTIFICIAL FLOATING FISH REEF).] *J. Fac. Mar. Sci. Technol. Tokai Univ.* No. 14. p. 343-355. 1981. In Japanese with English summ. SFA 27(1)
[Fac. Mar. Sci. Technol., Tokai Univ., Shimizu, Japan 424]

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82-000186 Kelso, B. W. and T. G. Northcote. CURRENT RESPONSE OF YOUNG RAINBOW TROUT FROM INLET AND OUTLET SPAWNING STOCKS OF A BRITISH COLUMBIA LAKE. *Int. Ver. Theor. Angew. Limnol. Verh.* 21(Part 2):1214-1221. 1981. SFA 27(1)
[Can. Dep. Environ., Environ. Prot. Serv., Vancouver, BC, Canada]

82-000187 Kelso, B. W.; T. G. Northcote and C. F. Wehrhahn. GENETIC AND ENVIRONMENTAL ASPECTS OF THE RESPONSE TO WATER CURRENT BY RAINBOW TROUT (*SALMO GAIRDNERI*) ORIGINATING FROM INLET AND OUTLET STREAMS OF TWO LAKES. *Can. J. Zool.* 59(11):2177-2185. Nov. 1981. In English with French summ. SFA 27(1)
[Can. Dep. Environ., Environ. Prot. Serv., West Vancouver, BC, Canada] Directional responses to water current by young rainbow trout fry, originating from seven parental stocks spawning in inlet or outlet streams of two British Columbia lakes, were studied in laboratory channels at three levels of temperature and two of illumination (light, dark). Intrastock and one complete 7 x 7 diallel cross were propagated for the experiment. The response of fry to water current was significantly affected by parental stock, illumination, and temperature. Significant genetic differences in current response scores were found among stocks in both light and dark trials. Mean upstream movement scores were generally higher for fry with outlet fathers than for those with inlet fathers. When data for the light and dark diallel experiments were combined, the mean difference in upstream movement scores between fry with outlet fathers and those with inlet fathers was 0.94 ± 0.26 which is significant at the 0.001 level. The corresponding mean difference between fry from outlet x outlet and inlet x inlet crosses was 1.34 ± 0.38 which is significant at the 0.0005 level. The interplay of genetic and environmental factors regulating lakeward migration of the young trout from the different types of parental spawning streams is discussed.

82-000188 Matsubara, J. A. ELECTROLOCATION IN WEAKLY ELECTRIC FISH: A NEUROETHOLOGICAL ANALYSIS. *Ph.D. dissertation, Univ. Calif. (San Diego)* 1980. From Diss. Abstr. Int. B Sci. Eng. 42(6):2247. Dec. 1981. SFA 27(1)

82-000189 Mazeaud, F. MORPHOLINE, A NONSPECIFIC ATTRACTANT FOR SALMONIDS. *Aquaculture* 26(1-2):189-191. Nov. 1981. SFA 27(1)
[Serv. Biochim.-Phys., Inst. Biol. Phys.-Chim., 13 rue Pierre et Marie Curie, 75 005, Paris, France] In a preliminary experiment on salmon ranching, we set up a trap on a secondary tributary of a river supposedly void of anadromous salmonids. Using morpholine as an attractant, we captured two rainbow trout, four sea trout and three Atlantic salmon, all these fish being sexually mature. Besides an imprinting mechanism, morpholine can act as a nonspecific attractant to non-imprinted fish.

82-000190 McKaye, K. R. FIELD OBSERVATION ON DEATH FEIGNING: A UNIQUE HUNTING BEHAVIOR BY THE PREDATORY CICHLID, *HAPLOCHROMIS LIVINGSTONI*, OF LAKE MALAWI. *Environ. Biol. Fishes* 6(3-4):361-365. 1 Nov. 1981. SFA 27(1)
[Dep. Biol., Yale Univ., P.O. Box 6666, New Haven, CT 06511]

82-000191 Moller, P. and T. Szabo. LESIONS IN THE NUCLEUS MESENCEPHALI EXTEROLATERALIS: EFFECTS ON ELECTROCOMMUNICATION IN THE MORMYRID FISH *GNATHONEMUS PETERSII* (MORMYRIFORMES). *J. Comp. Physiol. A Sens. Neural Behav. Physiol.* 144(3):327-333. Oct. 1981. SFA 27(1)
[Hunter Coll., New York, NY 10024]

82-000192 Nelson, D. O. and C. L. Prosser. TEMPERATURE-SENSITIVE NEURONS IN THE PREOPTIC REGION OF SUNFISH. *Am. J. Physiol.* 241(5):R259-R263. Nov. 1981. SFA 27(1)
[Dep. Physiol., Coll. Med., Ohio State Univ., Columbus 43210]

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[Inst. Freshwater Res., S-170 11 Drottningholm, Sweden]

82-000194 Partridge, B. L. INTERNAL DYNAMICS AND THE INTERRELATIONS OF FISH IN SCHOOLS. *J. Comp. Physiol. A Sens. Neural Behav. Physiol.* 144(3):313-325. Oct. 1981. SFA 27(1)
[Dep. Biol., Univ. Miami, Coral Gables, FL 33124]

82-000195 Phillips, R. R. and S. B. Swears. DIEL ACTIVITY CYCLES OF TWO CHESAPEAKE BAY FISHES, THE STRIPED BLENNY (*CHASMODES BOSQUIANUS*) AND THE OYSTER TOADFISH (*OPSANUS TAU*). *Estuaries* 4(4):357-362. Dec. 1981. SFA 27(1)
[Biol. Dep., State Univ. Coll., Oneonta, NY 13820] Diel activity cycles of toadfish and striped blennies were identified in the laboratory by means of mechanoelectric detector units. Data for both species were collected over 72-h periods. Daytime and nighttime activity rates were compared statistically. In addition, five 3-h segments (3 during the day and 2 at night) were selected for statistical comparison. Both species are more active at night than during the day. The toadfish appears to be more strictly nocturnal than does the blenny, with the peak in its activity occurring in the 3-h segment following dusk. Blenny activity increases throughout the night, reaching a peak during the 3-h segment before dawn. It then ebbs to a low in the afternoon.

82-000196 Reynolds, W. W. and M. E. Casterlin. BEHAVIORAL THERMOREGULATORY ABILITIES OF TROPICAL CORAL REEF FISHES: A COMPARISON WITH TEMPERATE FRESHWATER AND MARINE FISHES. *Environ. Biol. Fishes* 6(3-4):347-349. 1 Nov. 1981. SFA 27(1)
[Mar. Biol. Prog., Univ. New England, Biddeford, ME 04005]

82-000197 Rimmer, D. M. ON THE AUTUMNAL HABITAT CHANGE OF JUVENILE ATLANTIC SALMON (*SALMO SALAR* L.). *Ph.D. dissertation, Univ. New Brunswick* 1980. From Diss. Abstr. Int. B Sci. Eng. 42(6):2214. Dec. 1981. SFA 27(1)

82-000198 Robertson, D. R.; S. G. Hoffman and J. M. Sheldon. AVAILABILITY OF SPACE FOR THE TERRITORIAL CARIBBEAN DAMSELFISH *EUPOMACENTRUS PLANIFRONS*. *Ecology* 62(5):1162-1169. Oct. 1981. SFA 27(1)
[Smithsonian Trop. Res. Inst., Box 2072, Balboa, Panama]

82-000199 Takahashi, M.; S. Murachi and S. Moriwaki. A FEEDING DEVICE FOR FISHES DESIGNED FOR EXPERIMENTAL USE. *Bull. Jpn. Soc. Sci. Fish.* 47(9):1131-1134. Sept. 1981. SFA 27(1)
[Fac. Appl. Biol. Sci., Hiroshima Univ., Fukuyama 720, Japan] A demand feeder was designed and constructed for use in the conditioning experiments of fishes, with special attention paid to four points; that (1) it should provide only one pellet when the release mechanism is activated by the fish, (2) its trigger can be activated even by very light touch of the fish, (3) it should be protected from the actions of fishes other than those desired, and (4) it should be possible to manually activate the feeder whenever needed. By using this device in conjunction with an electromechanical event recorder, a continuous record on the feeding activity of a bluegill sunfish for 10 days

## BEHAVIOR (CONTINUED)

82-000199 CONTINUED was obtained. The observations revealed that the level of the feeding activity in the fish obtaining food from this device was much lower than that when the fish was fed by the experimenter.

82-000200 Takahashi, M.; S. Murachi; T. Sekitani; S. Moriwaki and T. Ogawa. FORMATION OF THE "BOBBER UPTHRUST RESPONSE" FOR FOOD-OBTAINING IN BLUEGILL SUNFISH *LEPOMIS MACROCHIRUS*. *Bull. Jpn. Soc. Sci. Fish.* 47(9):1135-1140. Sept. 1981. SFA 27(1)
[Fac. Appl. Biol. Sci., Hiroshima Univ., Fukuyama 720, Japan]

82-000201 Todd, G. T. EVOLUTION AND THE PROBLEM OF BUOYANCY IN CARTILAGINOUS AND BONY FISHES. *Ph.D. dissertation, Univ. Calif. (Los Angeles)* 114p. 1981. From Diss. Abstr. Int. B Sci. Eng. 42(5):1783. Nov. 1981. SFA 27(1)

82-000202 Tricas, T. C.; L. R. Taylor and G. Naftel. DIEL BEHAVIOR OF THE TIGER SHARK, *GALEOCERDO CUVIER*, AT FRENCH FRIGATE SHOALS, HAWAIIAN ISLANDS. *Copeia* 1981(4):904-908. 29 Dec. 1981. SFA 27(1)
[Dep. Zool., Univ. Hawaii, Honolulu 96822]

82-000203 Tsuchiya, A.; Y. Ohta; M. Nishimura and C. Miyazaki. CORRELATION ANALYSIS OF MAN-MADE UNDERWATER SOUND AND FISH BEHAVIOR. *J. Fac. Mar. Sci. Technol. Tokai Univ.* No. 14. p. 325-341. 1981. SFA 27(1)
[Fac. Mar. Sci. Technol., Tokai Univ., Shimizu, Japan 424]

82-000204 Webb, P. W. and R. S. Keyes. DIVISION OF LABOR BETWEEN MEDIAN FINS IN SWIMMING DOLPHIN (PISCES: CORYPHAENIDAE). *Copeia* 1981(4):901-904. 29 Dec. 1981. SFA 27(1)
[Sch. Nat. Resour., Univ. Mich., Ann Arbor 48109]

82-000205 Yamamoto, Y.; K. Hayama and S. Ikeda. [EFFECT OF DIETARY ASCORBIC ACID ON THE COPPER POISONING IN RAINBOW TROUT.] *Bull. Jpn. Soc. Sci. Fish.* 47(8):1085-1089. Aug. 1981. In Japanese with English summ. SFA 27(1)
[Dep. Food Sci., Fac. Home Econ., Kobe Coll., Nishinomiya 662, Japan]

82-000206 Yoshiyama, R. M. DISTRIBUTION AND ABUNDANCE PATTERNS OF ROCKY INTERTIDAL FISHES IN CENTRAL CALIFORNIA. *Environ. Biol. Fishes* 6(3-4):315-332. 1 Nov. 1981. SFA 27(1)
[Environ. Sci. Div., Oak Ridge Natl. Lab., Oak Ridge, TN 37830]

## LIFE HISTORY-GENERAL WORKS

82-000207 Azuma, M. ON THE ORIGIN OF KAYU, A LANDLOCKED FORM OF AMPHIDROMOUS AYU-FISH, *PLECOGLOSSUS ALTIVELIS*. *Int. Ver. Theor. Angew. Limnol. Verh.* 21(Part 2):1291-1296. 1981. SFA 27(1)
[Biol. Lab., Fac. Educ., Nagasaki Univ., 1-14 Bunkyo-Machi, Nagasaki 852, Japan]

LIFE HISTORY-GENERAL WORKS (CONTINUED)

82-000208 Crane, J. M., Jr. FEEDING AND GROWTH BY THE SESSILE LARVAE OF THE TELEOST *PORICHTHYS NOTATUS*. *Copeia* 1981(4):895-897. 29 Dec. 1981. SFA 27(1)
[Dep. Biol., Cerritos Coll., Norwalk, CA 90650]

82-000209 Crateau, E. J.; P. A. Moon and C. M. Wooley. BIOLOGY, POPULATION DYNAMICS AND MANAGEMENT OF *MORONE*, SP., WITH EMPHASIS ON NATIVE GULF OF MEXICO RACE AND INTRODUCED ATLANTIC RACE STRIPED BASS, APALACHICOLA RIVER, FLORIDA. *U.S. Fish Wildl. Serv.* iv + 105p. 1981. SFA 27(1)
[U.S. FWS, 1612 June Ave., Panama City, FL 32405]

82-000210 Druzhinin, A. D. SOME DATA ON THE SHARKSUCKER, *ECHENEIS NAUCRATES* (ECHENEIDAE), FROM THE INDIAN OCEAN. *J. Ichthyol. (Engl. Trans. Vopr. Ikhtiol.)* 20(5):149-151. 1980. SFA 27(1)
[VNIRO, Moscow, USSR] *Echeneis naucrates* was caught in small numbers by trawls at a depth of 18-141m, mainly to a depth of 75m. The length of *E. naucrates* varied between 30.5 and 81.0 cm, the weight between 440 and 1,490g. *E. naucrates* probably spawns from January to April. *E. naucrates* is a zoophage, consuming molluscs, crustaceans and their larvae and small fish.--Concl.

82-000211 Garton, J. S.; L. L. Olmsted and T. J. Edwards. A STUDY OF THE RAINBOW TROUT (*SALMO GAIRDNERI*, RICHARDSON) IN HOWARD CREEK, OCONEE COUNTY, SOUTH CAROLINA. *Duke Power Co.* DUKEPWR/76-01. 24p. Mar. 1976. SFA 27(1)
[Duke Power Co., Charlotte, NC] Howard Creek is presently supporting a self-sustaining rainbow trout population. In addition, fingerlings are stocked annually. Fingerlings stocked in May 1975 dispersed downstream, but none were collected more than 900 m from their point of stocking. Their average total length increased from 90 mm in May to 135 mm in December 1975. Native trout grew faster, from an average total length of 40 mm in April to 120 mm in December. During their second year trout ranged in total length from 135 to 200 mm, and some were sexually mature. Few harvestable size trout (>200 mm) were collected. Insects were the most important food item of trout, with the Plecoptera being the predominant order. The Blacknose dace (*Rhinichythys atratulus*) was the only other fish commonly collected.

82-000212 Gibson, R. N. and I. A. Ezzi. THE BIOLOGY OF THE NORWAY GOBY, *POMATOSCHISTUS NORVEGICUS* (COLLETT), ON THE WEST COAST OF SCOTLAND. *J. Fish Biol.* 19(6):697-714. Dec. 1981. SFA 27(1)
[Dunstaffnage Mar., Res. Lab., Oban, Argyll, Scotland] The biology of the small offshore goby, *Pomatoschistus norvegicus* (Collett), was studied on the west coast of Scotland over a period of 19 months. Catches were highest in April-June and lowest in August-September. Virtually all growth takes place in the first two summers, very little in those fish surviving to a third summer. The fish mature after their first winter and the breeding season lasts from March-July. Fecundity is linearly related to standard length and varies from approximately 1000-4000 eggs. Approximately 75% of fish survive their first breeding season but all die after their second. Males live slightly longer than females. The diet consists mainly of amphipods and small caridean decapods. The life history of the species is compared with other members of the genus.

82-000213 Kracht, R. and F.-W. Tesch. PROGRESS REPORT ON THE EEL EXPEDITION OF R. V. 'ANTON DOHRN' AND R. V. 'FRIEDRICH HEINCKE' TO THE SARGASSO SEA 1979. *Environ. Biol. Fishes* 6(3-4):371-375. 1 Nov. 1981. SFA 27(1)
[Biol. Anst. Helgoland, D-2000 Hamburg 50, West Germany]

## LIFE HISTORY-GENERAL WORKS (CONTINUED)

82-000214 Love, M. S. and W. V. Westphal. GROWTH, REPRODUCTION, AND FOOD HABITS OF OLIVE ROCKFISH, *SEBASTES SERRANOIDES*, OFF CENTRAL CALIFORNIA. *Fish. Bull.* 79(3):533-545. July 1981. SFA 27(1)
[Dep. Biol., Occidental Coll., 1600 Campus Rd., Los Angeles, CA 90041] We collected data on age-length and length-weight relationships, age at first maturity, spawning season, fecundity, and food habits of olive rockfish, *Sebastes serranoides*, off Diablo Cove, near Avila, California. Fish were aged from otoliths. Von Bertalanffy age-length parameters for females were $L_\infty$ = 5.19, k = 0.18, and $t_0$ = -1.57; for males $L_\infty$ = 43.3, k = 0.27, and $t_0$ = -1.03. Females grew at a faster rate than males beginning at the age where most males were mature. Age at first maturity ranged from 3 to 8 years, most fishes maturing by age 6. Olive rockfish spawned once per season, between December and March, with peak spawning in January. Fecundity ranged between 30,000 and 490,000 eggs. Small individuals preyed primarily on plankton, and larger ones concentrated on fishes, squids, and octopuses.

82-000215 O'Neil, P. E. LIFE HISTORY OF *ETHEOSTOMA COOSAE* (PISCES: PERCIDAE) IN BARBAREE CREEK, ALABAMA. *Tulane Stud. Zool. Bot.* 23(1):75-83. 30 Dec. 1981. SFA 27(1)
[Geol. Surv. Ala., P.O. Drawer O, University 35486] Collections of *Etheostoma coosae* (Coosa darter) were made from April 1977 to April 1978 in Barbaree Creek (Coosa River system), Clay County, Alabama. The principal habitat of this species was cobble and/or gravel raceways, riffles and pools. Spawning occurred on the surface of rocks and small boulders from mid March to late May with peak activity in mid April. The spawning position was either inclined or semi-inverted horizontally. Individuals reached sexual maturity and spawned by the first year. Maximum age was three years. By the end of the second year, the average size of males and females was 41.0 mm and 36.5 mm SL, respectively. The sex ratio, 1:1.3, was significantly different from 1:1. The principal diet consisted of Copepoda, Cladocera, Ephemeroptera (*Isonychia*) and Diptera (Chironomidae, Simuliidae).

82-000216 Palko, B. J.; G. L. Beardsley and W. J. Richards. SYNOPSIS OF THE BIOLOGY OF THE SWORDFISH, *XIPHIAS GLADIUS* LINNAEUS. *NOAA Tech. Rep. NMFS Circ.* 441. iv + 21p. Nov. 1981. SFA 27(1)
[NMFS, 75 Virginia Beach Dr., Miami, FL 33149]

82-000217 Smith, P. E.; J. R. Hunter; R. Lasker (ed.) and H. G. Moser. MARINE FISH LARVAE: MORPHOLOGY, ECOLOGY, AND RELATION TO FISHERIES. *Wash. Sea Grant Prog., Seattle* xiii + 131p. 30 Nov. 1981. Available @ $8.50 from Univ. Wash. Press, Seattle 98105]

82-000218 Stein, D. L. ASPECTS OF REPRODUCTION, EARLY LIFE HISTORY, AND BIOLOGY OF BATHYAL AND ABYSSAL LIPARIDIDAE AND MACROURIDAE (PISCES) OFF OREGON. *Ph.D. dissertaion, Oreg. State Univ.* 115p. 1982. From Diss. Abstr. Int. B Sci. Eng. 42(6):2178. Dec. 1981. SFA 27(1)

82-000219 Suzuki, K.; Y. Tanaka; S. Hioki and S. Ueno. [SPAWNING BEHAVIOR AND EARLY LIFE HISTORY OF *HYPODYTES RUBRIPINNIS* (PISCES: CONGIOPODIDAE) IN AN AQUARIUM.] *J. Fac. Mar. Sci. Technol. Tokai Univ.* No. 14. p. 357-367. 1981. In Japanese with English summ. SFA 27(1)
[Fac. Mar. Sci. Technol., Tokai Univ., Shimizu, Japan 424]

82-000220 Vostradovský, J. THE BIOLOGY (SIZE, GROWTH, FOOD) OF PIKE (*ESOX LUCIUS* L.) IN THREE CZECH RESERVOIRS. *Int. Ver. Theor. Angew. Limnol. Verh.* 21(Part 2):1264-1269. 1981. SFA 27(1)
[Res. Inst. Fish. Hydrobiol., Vodňany Res. Stn., 252 66 Libčice nad Vltavou, Czechoslovakia]

## POPULATION STUDIES, PRODUCTION, RECRUITMENT, ETC.

82-000221 Cooper, M. J. and G. A. Wheatley. AN EXAMINATION OF THE FISH POPULATION IN THE RIVER TRENT, NOTTINGHAMSHIRE USING ANGLER CATCHES. *J. Fish Biol.* 19(5):539-556. Nov. 1981. SFA 27(1)
[Severn-Trent Water Auth., Area Fish. Off., Meadow Lane, Nottingham NG2 3HN, England] During this study, anglers caught over 580 kg of fish, comprising over 29,500 individuals of 14 species. Nine times as many gudgeon, *Gobio gobio*, as roach, *Rutilus rutilus*, were caught. Gudgeon represented 35.94% of the total catch weight compared with 44.64% for roach. The mean total catch per man-hour was 8.9 fish and the mean catch rate was 176 g per man-hour. Population estimates for fish longer than 12 cm for all species other than gudgeon and bleak, *Alburnus alburnus*, gave fish densities of 0.21 fish $m^{-2}$, the roach population was 0.15 $m^{-2}$, and that for dace *Leuciscus leuciscus*, 0.02 $m^{-2}$. The population density for all sizes of all species caught was estimated to be 2.25 fish $m^{-2}$. The fish biomass available to the angler was 447 kg $ha^{-2}$. The rate of exploitation of the fishery over the period of sampling was high at 17%, representing an annual exploitation rate of 94%.

82-000222 Gascon, D. and R. A. Miller. COLONIZATION BY NEARSHORE FISH ON SMALL ARTIFICIAL REEFS IN BARKLEY SOUND, BRITISH COLUMBIA. *Can. J. Zool.* 59(9):1635-1646. Sept. 1981. In English with French summ. SFA 27(1)
[Dep. Zool., Univ. Alberta, Edmonton, AB T6G 2E9, Canada]

82-000223 Gjøsæter, J. ABUNDANCE AND PROTECTION OF LANTERNFISH (MYCTOPHIDAE) IN THE WESTERN AND NORTHERN ARABIAN SEA. *Fiskeridir. Skr. Ser. Havunders.* 17(6):215-251. 1981. SFA 27(1)
[Dep. Fish. Biol., Univ. Bergen, Norway]

82-000224 Jensen, A. L. POPULATION REGULATION IN LAKE WHITEFISH, *COREGONUS CLUPEAFORMIS* (MITCHILL). *J. Fish Biol.* 19(5):557-573. Nov. 1981. SFA 27(1)
[Sch. Nat. Resour., Univ. Mich., Ann Arbor 48109] Mechanisms that might compensate for changes in mortality are well known but documentation of their operation and determination of their relative capacities is difficult. In this study the potential of lake whitefish to compensate for fishing mortality is quantified using a conventional fishery stock assessment model. The mechanisms examined are proportion of females, fecundity, survival of eggs and larvae, decrease in age at maturity and growth. The change in each of these parameters necessary to maintain constant recruitment with increasing fishing pressure is determined. Decrease in age of maturity and increased survival of larvae and eggs have the greatest potential for compensation. The total capacity for compensation appears large even when the mechanisms are considered alone. A review of several lake whitefish population studies indicates a large variation in the vital statistics. There is a close relation between total mortality and growth. There is also a close relation between growth and age at maturity. The analyses indicate that increased fishing results in increased growth which then results in a lower age at maturity. This feedback mechanism enables lake whitefish to respond to changes in environmental conditions and on average to maintain a birth rate in balance with mortality.

82-000225 Lewis, G. E. and R. G. Morris. STANDING CROP OF FISH IN A SMALL WEST VIRGINIA FLOOD CONTROL IMPOUNDMENT. *Prog. Fish.-Cult.* 43(4):222. Oct. 1981. SFA 17(1)
[W.Va. Dep. Nat. Resour., Drawer C, Romney 26757]

## POPULATION STUDIES, PRODUCTION, RECRUITMENT, ETC. (CONTINUED)

82-000226 Mais, K. F. AGE-COMPOSITION CHANGES IN THE ANCHOVY, *ENGRAULIS MORDAX*, CENTRAL POPULATION. *Calif. Coop. Oceanic Fish. Invest. Rep.* 22:82-87. Oct. 1981. SFA 27(1)
[Calif. Dep. Fish Game, 350 Golden Shore, Long Beach 90802]

82-000227 Martin, F. D. and M. Cooper. A COMPARISON OF FISH FAUNAS FOUND IN PURE STANDS OF TWO TROPICAL ATLANTIC SEAGRASSES, *THALASSIA FESTUDINUM* AND *SYRINGODIUM FILIFORME*. *Northeast Gulf Sci.* 5(1):31-37. Oct. 1981. SFA 27(1)
[Univ. Md., Chesapeake Biol. Lab., Solomons 20788]

82-000228 Mathisen, O. A. and P. H. Poe. SOCKEYE SALMON CYCLES IN THE KVICHAK RIVER, BRISTOL BAY, ALASKA. *Int. Ver. Theor. Angew. Limnol. Verh.* 21(Part 2):1207-1213. 1981. SFA 27(1)
[Fish. Res. Inst., Coll. Fish., Univ. Wash., Seattle 98195]

82-000229 Randall, R. G. PRODUCTION RATE OF JUVENILE ATLANTIC SALMON (*SALMO SALAR* LINNAEUS) IN RELATION TO AVAILABLE FOOD IN TWO MIRAMICHI RIVER, N.B. NURSERY STREAMS. *Ph.D. dissertation, Univ. New Brunswick* 1981. From Diss. Abstr. Int. B Sci. Eng. 42(6):2187. 1981. SFA 27(1)

82-000230 Sale, P. F. and W. A. Douglas. PRECISION AND ACCURACY OF VISUAL CENSUS TECHNIQUE FOR FISH ASSEMBLAGES ON CORAL PATCH REEFS. *Environ. Biol. Fishes* 6(3-4):333-339. 1 Nov. 1981. SFA 27(1)
[Sch. Biol. Sci., Univ. Sydney, Sydney, N.S.W. 2006, Australia] A visual census technique is described in which the results of three separate enumerations of fish at a site are combined to produce a "best estimate" of the fish fauna present. Its precision and accuracy are examined, and compared to those of censuses obtained by modifications of the technique. Visual censuses can display high repeatability, but they seldom (if ever) completely sample the fish present at a site. Accuracy varies with technique used. In our tests, the preferred method yielded 82% of species and 75% of individuals known to be present and potentially censusable at the time the observations were made. Visual censuses are of comparable accuracy to ichthyocide collections of unenclosed sites, but the two methods sample different components of the total fish fauna. It is important when using visual censuses to remember that their accuracy is not 100%.

82-000231 Stauffer, G. D. and S. J. Picquelle. ESTIMATE OF THE SPAWNING BIOMASS OF THE NORTHERN ANCHOVY CENTRAL SUBPOPULATION FOR THE 1980-81 FISHING SEASON. *Calif. Coop. Oceanic Fish. Invest. Rep.* 22:8-13. Oct. 1981. SFA 27(1)
[NMFS, Southwest Fish. Cent., La Jolla, CA 92038]

82-000232 Sunada, J. S.; P. R. Kelly; I. S. Yamashita and F. Gress. THE BROWN PELICAN AS A SAMPLING INSTRUMENT OF AGE GROUP STRUCTURE IN THE NORTHERN ANCHOVY POPULATION. *Calif. Coop. Oceanic Fish. Invest. Rep.* 22:65-68. Oct. 1981. SFA 27(1)
[Calif. Dep. Fish Game, 350 Golden Shore, Long Beach 90802]

82-000233 Taylor, W. W.; M. N. Točko and S. D. Gerking. POPULATION CHARACTERISTICS OF THE OHRID RIFLE MINNOW, *ALBURNOIDES BIPUNCTATUS OHRIDANUS* (KARAMAN), IN LAKE OHRID, YUGOSLAVIA. *Int. Ver. Theor. Angew. Limnol. Verh.* 21(Part 2):1283-1286. 1981. SFA 27(1)
[Dep. Fish. Wildl., Mich. State Univ., East Lansing 48824]

## POPULATION STUDIES, PRODUCTION, RECRUITMENT, ETC. (CONTINUED)

82-000234 Thompson, J. M. PRELIMINARY REPORT ON THE POPULATION BIOLOGY AND FISHERY OF WALLEYE POLLOCK (*THERAGRA CHALCOGRAMMA*) OFF THE PACIFIC COAST OF CANADA. *Can. Tech. Rep. Fish. Aquatic Sci.* No. 1031. v + 157p. Aug. 1981. In English with French summ. SFA 27(1)
[Dep. Fish. Oceans, Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada]

82-000235 Tormosova, I. D. FORECASTING OF YEAR-CLASS STRENGTH IN THE NORTH SEA HADDOCK, *MELANOGRAMMUS AEGLEFINUS*, FROM SPAWNING EFFECTIVENESS. *J. Ichtyol. (Engl. Transl. Vopr. Ikhtiol.)* 20(5):152-155. 1980. SFA 27(1)
[AtlantNIRO, Kaliningrad, USSR] The strength of haddock year-classes is formed in the egg stage. The abundance of larvae depends on the number of eggs which have survived. The equations of linear regression between the strength of recruitment and the number of eggs and larvae which have survived may be used to forecast the strength of haddock year-classes over 2 years.--Concl.

82-000236 Zuyev, G. V. and V. N. Nikol'skiy. PROCEDURE FOR THE QUANTITATIVE RECORDING OF FLYINGFISHES (EXOCOETIDAE). *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 20(6):147-149. 1980. SFA 27(1)
[INVYuM, Ukrainian Acad. Sci., Sevastopol, USSR]

## SPAWNING HABITS AND MOVEMENTS, FECUNDITY, ETC.

82-000237 Álvarez-Lajonchere, L. ALGUNOS ASPECTOS SOBRE LA REPRODUCCIÓN DE *MUGIL LIZA* (PISCES: MUGILIDAE) EN TUNAS DE ZAZA, CUBA. [SOME ASPECTS OF REPRODUCTION OF *MUGIL LIZA* (PISCES: MUGILIDAE) IN TUNAS DE ZAZA, CUBA.] *Riv. Cubana Invest. Pesq.* 4(2):25-61. 1979. In Spanish with English summ. SFA 27(1)
[Cent. Invest. Pesq., Ave. 1ra. y 26, Miramar, Ciudad Habana, Cuba]

82-000238 Banerji, S. R. and N. K. Thakur. OBSERVATIONS ON THE SPAWNING BEHAVIOUR OF *ANABAS TESTUDINEUS* (BLOCH). *Indian J. Anim. Sci.* 51(6):651-654. 1981. SFA 27(1)
[Fish. Res., Bihar, India] The spawning behaviour of *Anabas testudineus* observed while breeding fish through hypophysation is described. For hypophysation, pituitary glands of the Indian major carp (*Labeo rohita*) were used at 2mg/100 g weight of recipient. Spawning act commenced 6 to 28hr after the injection. The mating acts occurred intermittently at intervals of 2 to 10 min, and there were 20 to 30 matings in different sets spread over 3 to 4 hr. The eggs were released in batches of 20 to 30. The role of second male in the breeding sets was examined. The second male contributed significantly in the overall spawning success. It not only hastened the spawning process but was actually involved in mating at the later phase.

82-000239 Bauer, J. A., Jr. and S. E. Bauer. REPRODUCTIVE BIOLOGY OF PIGMY ANGELFISHES OF THE GENUS *CENTROPYGE* (POMACANTHIDAE). *Bull. Mar. Sci.* 31(3):495-513. July 1981. SFA 27(1)
[7225 Old Oak Blvd., Suite 3G, Cleveland, OH 44130]

82-000240 Chebanov, N. A. SPAWNING BEHAVIOR OF THE PINK SALMON, *ONCORHYNCHUS GORBUSCHA*. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 20(6):64-73. 1980. SFA 27(1)
[KoTINRO, Petropavlovsk-Kamchatskiy, USSR] The spawning behavior of the pink salmon, *Oncorhynchus gorbuscha*, has been studied in a limited area of the spawning grounds (Karymayskiy spring, Bol'shaya River basin, W.

## SPAWNING HABITS AND MOVEMENTS, FECUNDITY, ETC. (CONTINUED)

82-000240 CONTINUED Kamchatka). The spawning contribution of small males is less than that of large males. Once the spawning area has been selected, females make few movements from it, which helps to protect the redds aginst excavation by other fishes. When the sex ratio is equal there is a real trend toward the selection of spawners of similar size at spawning time. Only the largest males may attend large and small females with equal frequency.

82-000241 Chen, C.; T. Taniuchi and Y. Nose. SOME ASPECTS OF REPRODUCTION IN THE POINTED-SNOUT DOGFISH *SQUALUS JAPONICUS* TAKEN OFF NAGASAKI AND CHOSHI. *Bull. Jpn. Soc. Sci. Fish.* 47(9):1157-1164. Sept. 1981. SFA 27(1)
[Dep. Fish., Natl. Taiwan Coll. Mar. Sci. Technol., Keelung, Taiwan, ROC]

82-000242 Ciechomski, J. D. de; C. A. Lasta; R. P. Sánchez and M. D. Ehrlich. DISTRIBUCIÓN DE HUEVOS Y LARVAS DE MERLUZA (*MERLUCCIUS HUBBSI*) EN EL MAR ARGENTINO EN DIFERENTES EPOCAS DEL AÑO Y EVALUACIÓN DE SUS EFECTIVOS DE ADULTOS DESOVANTES. [DISTRIBUTION OF EGGS AND LARVAE OF THE HAKE (*MERLUCCIUS HUBBSI*) IN THE SEA OFF ARGENTINA IN DIFFERENT SEASONS OF THE YEAR AND ASSESSMENT OF ITS SPAWNING STOCKS.] *Argentina Inst. Nac. Invest. Desar. Pesq. Contrib.* No. 380. 12p. Dec. 1979. In Spanish with English summ. SFA 27(1)
[Nac. Invest. Desar. Pesq., Casilla de Correo 175, 7600 Mar del Plata, Argentina]

82-000243 Ciechomski, J. D. de.; R. P. Sanchez; M. D. Ehrlich and C. A. Lasta. DISTRIBUCIÓN DE HUEVOS Y LARVAS DE ANCHOITA (*ENGRAULIS ANCHOITA*) EN EL MAR ARGENTINO EN DIFERENTES EPOCAS DEL AÑO Y EVALUACIÓN DE SUS EFECTIVOS DE ADULTOS DESOVANTES. [DISTRIBUTION OF EGGS AND LARVAE OF ANCHOVY, (*ENGRAULIS ANCHOITA*) IN THE SEA OFF ARGENTINA IN DIFFERENT SEASONS OF THE YEAR AND ASSESSMENT OF ITS SPAWNING STOCKS.] *Argentina Inst. Nac. Invest. Desar. Pesq. Contrib.* No. 379. 14p. Nov. 1979. In Spanish with English summ. SFA 27(1)
[Nac. Invest. Desar. Pesq., Casilla de Correo 175, 7600 Mar del Plata, Argentina]

82-000244 De Martini, E. E. and R. K. Fountain. OVARIAN CYCLING FREQUENCY AND BATCH FECUNDITY IN THE QUEENFISH, *SERIPHUS POLITUS*: ATTRIBUTES REPRESENTATIVE OF SERIAL SPAWNING FISHES. *NOAA Fish. Bull.* 79(3):547-560. July 1981. SFA 27(1)
[Mar. Sci. Inst., Univ. Calif., Santa Barbara 93106]

82-000245 Fadeyeva, T. A. MALE GONAD DEVELOPMENT AND THE SIZE-AGE COMPOSITION OF THE CASPIAN SEVRYUGA, *ACIPENSER STELLATUS*, DURING THE MARINE PERIOD OF LIFE. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 20(6):54-64. 1980. SFA 27(1)
[VNIRO, Moscow, USSR]

82-000246 Francis, M. P. SPAWNING MIGRATION OF MOKI (*LATRIDOPSIS CILIARIS*) OFF EASTERN NEW ZEALAND. *N.Z. J. Mar. Freshwater Res.* 15(3):267-273. 1981. SFA 27(1)
[Fish. Res. Div., Minist. Agric. Fish., P.O. Box 297, Wellington, New Zealand]

82-000247 Goldberg, S. R. SEASONAL SPAWNING CYCLE OF THE BLACK CROAKER, *CHEILOTREMA SATURNUM* (SCIAENIDAE). *NOAA Fish. Bull.* 79(3):561-562. July 1981. SFA 27(1)
[Dep. Biol., Whittier Coll., Whittier, CA 90608]

## SPAWNING HABITS AND MOVEMENTS, FECUNDITY, ETC. (CONTINUED)

82-000248 Kroll, W. THE BEHAVIOR OF THE AFRICAN KILLIFISH, *APHYOSEMION GARDNERI*: NORMATIVE STUDIES. *Environ. Biol. Fishes* 6(3-4):277-284. 1 Nov. 1981. SFA 27(1)
[Dep. Biol., Loyola Univ. Chicago, 6525 N. Sheridan Rd., Chicago, IL 60626]

82-000249 Laudien, H. and V. Schlieker. TEMPERATURE DEPENDENCE OF COURTSHIP BEHAVIOUR IN THE MALE GUPPY, *POECILIA RETICULATA*. *J. Therm. Biol.* 6(4):307-314. Oct. 1981. SFA 27(1)
[Dep. Zool., Univ. Kiel, D-2300 Kiel, West Germany]

82-000250 Lisovenko, L. A. THE FECUNDITY OF THE GRENADIER, *CORYPHAENOIDES HOLOTRACHYS*, FROM THE FALKLAND-PATAGONIAN REGION IN RELATION TO LENGTH AND WEIGHT. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 20(5):158-160. 1980. SFA 27(1)
[VNIRO, Moscow, USSR]

82-000251 Maruyama, T. [COMPARATIVE ECOLOGY ON THE FLUVIAL FORMS OF *SALMO (ONCORHYNCHUS) MASOU MASOU* (BREVOORT) AND *SALVELINUS LEUCOMAENIS* (PALLAS) (PISCES, SALMONIDAE) I. STRUCTURE OF SPAWNING REDDS AND SPAWNING SITES IN KAMIDANI, RIVER YURA. *Jpn. J. Ecol.* 31(3):269-284. Sept. 1981. In Japanese with English summ. SFA 27(1)
[Res. Lab., Fish. Resour., Tokyo Univ., Tokyo 108, Japan]

82-000252 Middaugh, D. P. REPRODUCTIVE ECOLOGY AND SPAWNING PERIODICITY OF THE ATLANTIC SILVERSIDE, *MENIDIA MENIDIA* (PISCES: ATHERINIDAE). *Copeia* 1981(4):766-776. 29 Dec. 1981. SFA 27(1)
[Gulf Breeze Environ. Res. Lab., Sabine Island, Gulf Breeze, FL 32561]

82-000253 Middaugh, D. P.; G. I. Scott and J. M. Dean. REPRODUCTIVE BEHAVIOR OF THE ATLANTIC SILVERSIDE, *MENIDIA MENIDIA* (PISCES, ATHERINIDAE). *Environ. Biol. Fishes* 6(3-4):269-276. 1 Nov. 1981. SFA 27(1)
[U.S. EPA, Gulf Breeze Environ. Res. Lab., Sabine Island, Gulf Breeze, FL 32561] The spawning behavior of the Atlantic silverside, *Menidia menidia*, was studied at two sites on the North Edisto River estuary in South Carolina. Prespawning schools moved back and forth along the shoreline as the time of high tide approached. Spawning runs took place in the upper intertidal zone at high tide. Spawning fish deposited their eggs on three types of substrates: 1) the lower stems of cordgrass plants, *Spartina alterniflora*, 2) detrital mats, and 3) exposed cordgrass roots along erosional scraps. Spawning behavior during egg deposition and fertilization was similar for all three substrates. Females released eggs during a rapid fluttering motion of the posterior half of the body. A similar movement accompanied release of sperm by males. Behavior of fish just prior to spawning insured deposition of gametes at locations that provided protection from thermal and drying stress during development. Eggs were deposited at mean intertidal elevations of 1.8 and 1.5 meters above mean low water (MLW) at respective study sites. They were exposed to the atmosphere for approximately ten hours between successive high tides. During spawning runs in which eggs were deposited at the base of cordgrass plants, ambient dissolved oxygen concentrations of the water in the spawning area were sometimes reduced to <1.0 mg. $l^{-1}$. Spent fish, apparently incurring an oxygen debt while spawning, formed a nonschooling aggregation offshore from the spawning zone. The recurrent use of specific spawning substrates for egg deposition resulted in an uneven distribution of spawning runs along the shoreline at each study site.

## SPAWNING HABITS AND MOVEMENTS, FECUNDITY, ETC. (CONTINUED)

82-000254 Moreau, G. STRATÉGIE DE REPRODUCTION CHEZ LES POPULATIONS NORDIQUES DE GRANDS CORÉGONES *(COREGONUS CLUPEAFORMIS)*. [REPRODUCTION STRATEGY OF NORTHERN POPULATIONS OF LAKE WHITEFISH *(COREGONUS CLUPEAFORMIS)*. *Int. Ver. Theor. Angew. Limnol. Verh.* 21(Part 2):1251-1256. 1981. In French. with English summ. SFA 27(1)
[Univ. Laval, Dep. Biol., Cité Univ., Quebec, PQ G1K 7P4, Canada]

82-000255 Nakatani, T. and T. Maeda. TRANSPORT PROCESS OF THE ALASKA POLLACK EGGS IN FUNKA BAY AND THE ADJACENT WATERS, HOKKAIDO. *Bull. Jpn. Soc. Sci. Fish.* 47(9):1115-1118. Sept. 1981. SFA 27(1)
[Fac. Fish., Hokkaido Univ., Minato-3, Hakodate 041, Japan]

82-000256 Ottaway, E. M.; P. A. Carling; A. Clarke and N. A. Reader. OBSERVATIONS ON THE STRUCTURE OF BROWN TROUT, *SALMO TRUTTA* LINNAEUS, REDDS. *J. Fish Biol.* 19(5):593-607. Nov. 1981. SFA 27(1)
[Freshwater Biol. Assoc., Ferry House, Ambleside, Cumbria LA22 0LP, England] This paper describes the gravel type and structure of brown trout spawning gravels in Teesdale, the flow characteristics of the spawning sites and the size of redds. Factors influencing redd size are investigated and it is concluded that female size is a major factor. Relationships are established between various redd characteristics and the fork length of female fish. The findings are discussed in relation to the existing literature concerning salmonid spawning sites.

82-000257 Reed, J. K. and R. G. Gilmore. INSHORE OCCURRENCE AND NUPTIAL BEHAVIOR OF THE ROUGHTAIL STRINGRAY, *DASYATIS CENTROURA* (DASYATIDAE), ON THE CONTINENTAL SHELF, EAST CENTRAL FLORIDA. *Northeast Gulf Sci.* 5(1):59-62. Oct. 1981. SFA 27(1)
[Harbor Beach Found., Inc., RR 1, Box 196, Fort Pierce, FL 33450]

82-000258 Samarakoon, J. I. PARENTAL BEHAVIOR AND ECOLOGY OF THE ASIAN CICHLIDS *ETROPLUS SURATENSIS* AND *ETROPLUS MACULATUS*. *Ph.D. dissertation, Ill. State Univ.* 348p. 1981. From Diss. Abstr. Int. B Sci. Eng. 42(5):1782. Nov. 1981. SFA 27(1)

82-000259 Teskeredzic, Z. THE SPAWNING OF THE SARDINE (*SARDINA PILCHARDUS* [WALB.]) IN THE KVARNER REGION OF THE ADRIATIC SEA. *Thalassia Jugosl.* 14(3-4):323-338. 1978. SFA 27(1)
[Cent. Mar. Res., Ruder Bošković Inst., Zagreb, Yugoslavia] In the North Adriatic, in the Kvarner Region, which includes the Gulf of Rijeka examinations were carried out to investigate the presence of planktonic eggs in the spawning season 1972/1973. The field observations were performed once or twice a month, at 12 stations. The samples were taken by vertical tows with a modified Helgoland type plankton net, with an aperature of 0.5 $m^2$, from the depth of 30 m towards the surface. The material was preserved in 2.5% neutralized formaldehyde. During each field trip, some hydrographical data (temperature and salinity) at each station were also taken. The results confirm the known fact that the sardine spawns in the Northern Adriatic in the period between November and June. The maximum quantities of sardine eggs were obtained in November and in April when the spawning of sardine reached its first and second maximum, respectively. The most intensive spawning of the sardine took place in the southern part of Kvarner, at a temperature of 11.6-11.7°C and at a salintiy of 33.08-38.17 $^0$/oo.

## MOVEMENTS, SEASONAL AND DEPTH DISTRIBUTION, ETC.

82-000260 Marsh, A. C. and A. J. Ribbink. A COMPARISON OF THE ABILITIES OF

## MOVEMENTS, SEASONAL AND DEPTH DISTRIBUTION, ETC. (CONTINUED)

82-000260 CONTINUED THREE SYMPATRIC SPECIES OF *PETROTILAPIA* (CICHLIDAE, LAKE MALAWI) TO PENETRATE DEEP WATER. *Environ. Biol. Fishes* 6(3-4):367-369. 1 Nov. 1981. SFA 27(1)
[J. L. B. South Inst. Ichthyology, Rhodes Univ., Grahamstown 6140, South Africa]

82-000261 Neves, R. J. OFFSHORE DISTRIBUTION OF ALEWIFE, *ALOSA PSEUDOHARENGUS*, AND BLUEBACK HERRING, *ALOSA AESTIVALIS*, ALONG THE ATLANTIC COAST. *NOAA Fish. Bull.* 79(3):473-485. July 1981. SFA 27(1)
[Va. Coop. Fish. Res. Unit., 106 Cheatham Hall, VPI&SU, Blacksburg, VA 24061]

82-000262 Thorpe, J. E.; L. G. Ross; G. Struthers and W. Watts. TRACKING ATLANTIC SALMON SMOLTS, *SALMO SALAR* L., THROUGH LOCH VOIL, SCOTLAND. *J. Fish Biol.* 19(5):519-537. Nov. 1981. SFA 27(1)
[Freshwater Fish. Lab., Pitlochry, Scotland]

82-000263 Todd, P. R. TIMING AND PERIODICITY OF MIGRATING NEW ZEALAND FRESHWATER EELS (*ANGUILLA* SPP.). *N.Z. J. Mar. Freshwater Res.* 15(3):225-235. 1981. SFA 27(1)
[Fish. Res. Div., Minist. Agric. Fish., Private Bag, Christchurch, New Zealand]

82-000264 Wahle, R. J.; E. Chaney and R. E. Pearson. AREAL DISTRIBUTION OF MARKED COLUMBIA RIVER BASIN SPRING CHINOOK SALMON RECOVERED IN FISHERIES AND AT PARENT HATCHERIES. *Mar. Fish. Rev.* 43(12):1-9. Dec. 1981. SFA 27(1)
[NMFS, P.O. Box 4332, Portland, OR 97208]

## FOODS/FEEDING

82-000265 Adámek, Z. and T. D. Sanh. THE FOOD OF GRASS CARP FRY (*CTENOPHARYNGODON IDELLA*) IN SOUTHERN MORAVIAN FINGERLING PONDS. *Folia Zool.* 30(3):263-270. 1981. In English with Russian summ. SFA 27(1)
[Dep. Fish. Water Prot., Univ. Agric., Brno, Czechoslovakia] The authors preformed food analyses in 114 fingerlings of grass carp, ranging from 29 to 82mm in size. The major food components included zooplankton (*Cladocera, Rotatoria, Copepoda*), zoobenthos (*Chironomidae* and *Ephemeroptera*), plants (macrovegetation and filamentous algae), and detritus. The filling of digestive tracts decreased with decreasing water temperature; below 10°C the food was consumed only sporatically.

82-000266 Brusven, M. A. and S. T. Rose. INFLUENCE OF SUBSTRATE COMPOSITION AND SUSPENDED SEDIMENT ON INSECT PREDATION BY THE TORRENT SCULPIN, *COTTUS RHOTHEUS*. *Can. J. Fish. Aquatic Sci.* 38(11):1444-1448. Nov. 1981. SFA 27(1)
[Dep. Entomol., Univ. Idaho, Moscow, 83843]

82-000267 Clady, M. D. SURVIVAL AND SHIFTS IN FOOD OF YOUNG-OF-YEAR *MICROPTERUS* PENNED AT HIGH DENSITIES IN AN OKLAHOMA POND. *Proc. Okla. Acad. Sci.* 61:15-22. 1981. SFA 27(1)
[Okla. Coop. Fish. Res. Unit, Okla. State Univ., Stillwater 74074]

## FOODS/FEEDING (CONTINUED)

82-000268 Darcy, G. H. FOOD HABITS OF THE CRESTED GOBY, *LOPHOGOBIUS CYPRINOIDES*, IN TWO DADE COUNTY, FLORIDA, WATERWAYS. *Bull. Mar. Sci.* 31(4):928-932. Oct. 1981. SFA 27(1)
[Rosenstiel Sch. Mar. Atmos. Sci., Univ. Miami, 4600 Rickenbacher Causeway, Miami, FL 33149]

82-000269 Dill, L. M.; R. C. Ydenberg and A. H. G. Fraser. FOOD ABUNDANCE AND TERRITORY SIZE IN JUVENLILE COHO SALMON (*ONCORHYNCHUS KISUTCH*). *Can. J. Zool.* 59(9):1801-1809. Sept. 1981. In English with French summ. SFA 27(1)
[Dep. Biol. Sci., Simon Fraser Univ., Burnaby, BC V5A 1S6, Canada] Feeding territory size and potential food abundance were measured simultaneously in a field population of juvenile (40-50 mm) coho salmon. Territory size was inversely related to the density of benthic food on the territory, as predicted from an energy-based model of territoriality. The relationship between the abundance of drift food and territory size was in the predicted direction, but was not significant. Territories were also smaller where intruder pressure was higher, but intrusion rate and food abundance were not directly correlated. Therefore, the effect of food abundance on territory size was not caused indirectly by attraction of nonterritorial fish to areas where food was abundant. In the laboratory, the distance from which a resident coho attacked an approaching model intruder increased asymptotically with hunger. The fish therefore appear to possess an appropriate behavioural mechanism (tactic) to adjust territory size to local food abundance.

82-000270 Eie, J. A. and R. Borgstrøm. DISTRIBUTION AND FOOD OF ROACH [*RUTILUS RUTILUS* (L.)] AND PERCH (*PERCA FLUVIATILIS* L.) IN THE EUTROPHIC LAKE ÅRUNGEN, NORWAY. *Int. Ver. Theor. Angew. Limnol. Verh.* 21(Part 2):1257-1263. 1981. SFA 27(1)
[Inst. Nat. Conserv., Agric. Univ. Norway, P.O. Box 39, N-1432 Ås-NLH, Norway]

82-000271 Janssen, J. and G. R. Harbison. FISH IN SALPS: THE ASSOCIATION OF SQUARETAILS (*TETRAGONURUS* SPP.) WITH PELAGIC TUNICATES. *J. Mar. Biol. Assoc. U.K.* 61(4):917-927. Nov. 1981. SFA 27(1)
[Biol. Dep., Loyola Univ., 6525 North Sheridan Rd., Chicago, IL 60626] *Tetragonurus* is a rarely collected genus of stromateoid fishes from the open ocean found widely in tropical and temperate regions. SCUBA divers have collected the young of all three species (*T. cuvieri*, *T. atlanticus* and *T. pacificus*) living inside salps. The fishes use their unusual dentition to bite off parts of salps and pyrosomes. They enter salps via the atrial opening and, while inside, eat the salps' gut and gill bar. Consumption of the gut from outside the salp is hampered by a tough shield around the gut, the arrangement of individual salps in a colony, and processes from the salps' tests. The fish also consume test processes from *Pyrosoma* colonies and enter into the cloacal chambers. The morphology and behaviour of *Tetragonurus* provide convincing evidence that these fishes are specifically adapted for life in association with pelagic tunicates. The present study, and observations on other pelagic and planktonic organisms, indicate that associations such as this are common in the open ocean.

82-000272 Konchina, Yu. V. THE PERUVIAN JACK MACKEREL, *TRACHURUS SYMMETRICUS MURPHYI*, A FACULTATIVE PREDATOR IN THE COASTAL UPWELLING ECOSYSTEM. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 20(5):46-59. 1980. SFA 27(1)
[VNIRO, Moscow, USSR]

82-000273 Kornilova, G. N. FEEDING OF YELLOWFIN TUNA, *THUNNUS ALBACARES*, AND BIGEYE TUNA, *THUNNUS OBESUS*, IN THE EQUATORIAL ZONE OF THE INDIAN OCEAN. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)*

FOODS/FEEDING (CONTINUED)

82-000273 CONTINUED 20(6):111-119. 1980. SFA 27(1)
[AZCherNIRO, Kerch, USSR] A study was made of the feeding of yellowfin tuna, *Thunnus albacares*, and the bigeye tuna, *T. obesus*, caught during the summer in the equatorial zone of the Indian Ocean, from areas in which tunas had high indices of fullness. Fish is the greatest percentage by weight in the food of tunas; cephalopods and crustaceans account for smaller percentages. In some parts of the zone there are various combinations of forage organisms with 1-2 dominant organisms in the food of tunas. Competition for the same prey is reduced in the 2 tuna species by feeding at different depths.

82-000274 Luecke, C. and W. J. O'Brien. PREY LOCATION VOLUME OF A PLANKTIVOROUS FISH: A NEW MEASURE OF PREY VULNERABILITY. *Can. J. Fish. Aquatic Sci.* 38(10):1264-1270. Oct. 1981. In English with French summ. SFA 27(1)
[Dep. Syst. Ecol., Univ. Kans., Lawrence 66045]

82-000275 Lundberg, B. ALGAL VEGETATION AND ALGAE AS A FISH DIET AT TWO BASINS IN THE GULF OF ELAT (AQABA). *Bull. Mar. Sci.* 31(3):810. July 1981. Abstract only. SFA 27(1)

82-000276 McCrone, L. E. DIEL VERTICAL MIGRATION AND FEEDING BEHAVIOR OF SOME MESOPELAGIC FISHES IN THE EASTERN SUBARCTIC PACIFIC OCEAN. *Ph.D. dissertation, Univ. Wash.* 225p. 1981. From Diss. Abstr. Int. B Sci. Eng. 42(6):2177. Dec. 1981. SFA 27(1)

82-000277 Medved, R. J. and J. A. Marshall. FEEDING BEHAVIOR AND BIOLOGY OF THE YOUNG SANDBAR SHARKS, *CARCHARHINUS PLUMBEUS* (PISCES, CARCHARHINIDAE), IN CHINCOTEAGUE BAY, VIRGINIA. *NOAA Fish. Bull.* 79(3):441-447. July 1981. SFA 27(1)
[Grad. Sch. Oceanogr., Univ. R.I., Kingston 02881] During the summers of 1977, 1978, and 1979 the feeding behavior and biology of young sandbar sharks were investigated in Chinocoteague Bay, Virginia, using catch data obtained from rod and reel fishing. Mean catch per unit effort for the study was 1.02 sharks per hour, but yearly differences in catch per unit effort were found. Sandbar sharks were not caught before the first week in June despite substantial fishing effort prior to this time, both in 1977 and 1978. Catch per unit effort was higher at night than during the day but was not related to tidal current stage or speed. Captures were made at surface, mid, and bottom fishing depths. During the day, catch per unit effort was highest at the bottom fishing depth but did not differ among the three depths during the night. The blue crab, *Callinectes sapidus*, was found in 41.3% of the stomachs examined; 20% of the stomachs were empty, and the remainder contained various crustaceans and fishes. The proportion of empty or nearly empty stomachs was greater for night captures than for day captures. Yearly differences in sex ratio existed and the total length distribution of sharks measured suggested the presence of relatively distinct size classes.

82-000278 Naughton, S. P. and C. H. Saloman. STOMACH CONTENTS OF JUVENILES OF KING MACKEREL (*SCOMBEROMORUS CAVALLA*) AND SPANISH MACKEREL (*S. MACULATUS*). *Northeast Gulf Sci.* 5(1):71-74. Oct. 1981. SFA 27(1)
[NMFS, 3500 Delwood Beach Rd., Panama City, FL 32407]

82-000279 Poddubnyy, A. G. and A. I. Bakanov. QUANTITATIVE ESTIMATION OF BENTHOS CONSUMPTION BY FISHES. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 20(6):102-111. 1980. SFA 27(1)
[Inst. Biol. Inland Waters, USSR Acad. Sci., Borok, Yaroslavl Prov., USSR]

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82-000280 Portsev, P. I. THE FEEDING OF THE CUTLASSFISH, *TRICHIURUS LEPTURUS* (TRICHIURIDAE), OFF THE WEST COAST OF INDIA. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 20(5):60-65. 1980. SFA 27(1)
[AzCherNIRO, Kerch, USSR]

82-000281 Potts, G. W. BEHAVIOURAL INTERACTIONS BETWEEN THE CARANGIDAE (PISCES) AND THEIR PREY ON THE FORE-REEF SLOPE OF ALDABRA, WITH NOTES ON OTHER PREDATORS. *J. Zool. (Lond.)* 195(3):385-404. Nov. 1981. SFA 27(1)
[Mar. Biol. Assoc. U.K., Citadel Hill, Plymouth, England]

82-000282 Stewart, D. J.; J. F. Kitchell and L. B. Crowder. FORAGE FISHES AND THEIR SALMONID PREDATORS IN LAKE MICHIGAN. *Trans. Am. Fish. Soc.* 110(6):751-763. Nov. 1981. SFA 27(1)
[Fish Div., Dep. Zool., Field Mus. Nat. Hist., Chicago, IL 60605]

82-000283 Uotani, I.; K. Matsuzaki; Y. Makino; K. Noda; O. Inamura and M. Horikawa. [FOOD HABITS OF LARVAE OF TUNAS AND THEIR RELATED SPECIES IN THE AREA NORTHWEST OF AUSTRALIA.] *Bull. Jpn. Soc. Sci. Fish.* 47(9):1165-1172. Sept. 1981. In Japanese with English summ. SFA 27(1)
[Fac. Mar. Sci. Technol., Tokai Univ., Shimizu 424, Japan] Gut contents of a total of 4159 larvae of albacore, yellowfin tuna, bigeye tuna, southern bluefin tuna, skipjack and fregate tuna collected in the area northwest of Australia from Oct. 1977 to Jan. 1978, and from Dec. 1978 to Mar. 1979, were examined. The results obtained are as follows. 1. Gut contents of tunas and those of skipjack and fregate tuna are noticeably different in the composition of food elements: Four species of tunas feed generally on the Copepoda and other zooplanktons in nearly equal numbers of slightly more Copepoda, whereas skipjack and fregate tuna Appendicularia and *Evadne*. 2. Ivlev's electivity index indices suggest that the difference in the food composition between the above two groups of larvae could be attributable to the difference in their feeding habit on prey organisms, not to the plankton composition in their habitats. 3. Individual gut contents of four species of tunas are mainly small ones of 0.21-0.80 mm body length. Gut contents of skipjack and fregate tuna, however, comprize a large quantity of those exceeding 0.81 mm body length.

82-000284 Witzell, W. N. PREDATION ON JUVENILE GREEN SEA TURTLES *CHELONIA MYDAS*, BY A GROUPER, *PROMICROPS LANCEOLATUS* (PISCES; SERRANIDAE) IN THE KINGDOM OF TONGA, SOUTH PACIFIC. *Bull. Mar. Sci.* 31(4):935-936. Oct. 1981. SFA 27(1)
[NMFS, Southeast Fish. Cent., 75 Virginia Beach Dr., Miami, FL 33149]

AGE AND GROWTH

82-000285 Brege, D. A. GROWTH CHARACTERISTICS OF YOUNG-OF-THE-YEAR WALLEYE, *STIZOSTEDION VITREUM VITREUM*, IN JOHN DAY RESERVOIR ON THE COLUMBIA RIVER, 1979. *NOAA Fish. Bull.* 79(3):567-569. July 1981. SFA 27(1)
[NMFS, 2725 Montlake Blvd. East, Seattle, WA 98112]

82-000286 Chubb, C. F.; I. C. Potter; C. J. Grant; R. C. J. Lenanton and J. Wallace. AGE STRUCTURE, GROWTH RATES AND MOVEMENTS OF SEA MULLET, *MUGIL CEPHALUS* L., AND YELLOW-EYE MULLET, *ALDRICHETTA FORSTERI*

## AGE AND GROWTH (CONTINUED)

**82-000285 CONTINUED**
[Inst. Vert. Zool., Czech. Acad. Sci., Brno, Czechoslovakia] Using a sample of 811 individuals of bream, *Abramis brama* (Linnaeus, 1758), from the Mostiště reservoir the author analysed the growth, age and mortality. The length class 180 mm (standard length), weight class 40 to 60g and the age groups V to IX were the most numerous. Three formulae for the conversion of the standard length to the total length and *vice versa* are given for three different length classes of fish. The formula for the length class 191 to 240mm (standard length) is as follows: l=0.77XL; L=1.30Xl. In the oral sector of the scales there were 2 to 6 radii, mostly 3; in the caudal sector 10 to 31 radii, mostly 14. The year mark in one to three year old bream was formed in the spring; that in older fish, in the autumn. The intercept estimated by fitting the body scale relationship by eye was 20mm; that computed using the linear functional regression, 23.6mm. The growth rate of the bream was very slow. The values of the coefficient of condition varied between 1.61 and 2.83. The mortality of males was 50%, that of females was by 7 to 8% lower.

**82-000286** Goldspink, C. R. A NOTE ON THE GROWTH-RATE AND YEAR-CLASS STRENGTH OF BREAM, *ABRAMIS BRAMA* (L.), IN THREE EUTROPHIC LAKES, ENGLAND. *J. Fish Biol.* 19(6):665-673. Dec. 1981. SFA 27(1)
[Dep. Biol. Sci., Manchester Polytech., Manchester M15 GD, England] In this study some comparative observations on the growth-rate and year-class strength of bream, *Abramis brama*, in three Shropshire-Cheshire meres are given. All populations are exposed to variable recruitment. The occurrence of four strong year-classes (1959, 1966, 1969, 1973) suggests that climate is an important factor influencing spawning success. Water temperatures ≥16°C in July and August may be particulary important. All other intervening year-classes are absent. The growth-rate of bream in Tatton Mere and Ellesmere Mere is good ($L_\infty$=541-561 mm) but comparatively poor ($L_\infty$=448 mm) in Cole Mere. The significance of population density, food supply and parasitic infestation by *Ligula intestinalis* is discussed.

**82-000287** Kochkin, P. N. HOW TO PREPARE FISH VERTEBRAE FOR AGE DETERMINATION. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 20(6):153-157. 1980. SFA 27(1)
[VNIRO, Moscow, USSR]

**82-000288** Layher, W. G. COMPARISON OF ANNULUS COUNTS OF PECTORAL AND DORSAL SPINES IN FLATHEAD CATFISH. *Prog. Fish.-Cult.* 43(4):218-219. Oct. 1981. SFA 27(1)
[Okla. Coop. Fish. Res. Unit, Life Sci. West 433, Okla. State Univ., Stillwater 74074]

**82-000289** Marí, A. and R. Dominguez. DISTRIBUCIÓN, EDAD Y CRECIMIENTO DE LA MERLUZA PLATEADA (*MERLUCCIUS BILINEARIS*) EN LA PLATAFORMA DE NUEVA ESCOCIA. [DISTRIBUTION, AGE AND GROWTH OF SILVER HAKE (*MERLUCCIUS BILINEARIS*) IN THE NOVA SCOTIAN SHELF.] *Riv. Cubana Invest. Pesq.* 4(2):78-106. 1979. SFA 27(1)
[Cent. Invest. Pesq., Ave. 1ra. y 26, Miramar, Ciudad Habana, Cuba]

**82-000290** Mallicoate, D. L. and R. H. Parrish. SEASONAL GROWTH PATTERNS OF CALIFORNIA STOCKS OF NORTHERN ANCHOVY, *ENGRAULIS MORDAX*, PACIFIC MACKEREL, *SCOMBER JAPONICUS*, AND JACK MACKEREL, *TRACHURUS SYMMETRICUS*. *Calif. Coop. Oceanic Fish. Invest. Rep.* 22:69-81. Oct. 1981. SFA 27(1)
[NMFS, Southwest Fish Cent., Monterey, CA 93940]

## AGE AND GROWTH (CONTINUED)

82-000292 CONTINUED
[Okla. Coop. Fish. Res. Unit, Life Sci. West 433, Okla. State Univ., Stillwater 74074]

82-000293 Marí, A. and R. Dominguez. DISTRIBUCIÓN, EDAD Y CRECIMIENTO DE LA MERLUZA PLATEADA (*MERLUCCIUS BILINEARIS*) EN LA PLATAFORMA DE NUEVA ESCOCIA. [DISTRIBUTION, AGE AND GROWTH OF SILVER HAKE (*MERLUCCIUS BILINEARIS*) IN THE NOVA SCOTIAN SHELF.] *Riv. Cubana Invest. Pesq.* 4(2):78-106. 1979. SFA 27(1)
[Cent. Invest. Pesq., Ave. 1ra. y 26, Miramar, Ciudad Habana, Cuba]

82-000294 Mallicoate, D. L. and R. H. Parrish. SEASONAL GROWTH PATTERNS OF CALIFORNIA STOCKS OF NORTHERN ANCHOVY, *ENGRAULIS MORDAX*, PACIFIC MACKEREL, *SCOMBER JAPONICUS*, AND JACK MACKEREL, *TRACHURUS SYMMETRICUS*. *Calif. Coop. Oceanic Fish. Invest. Rep.* 22:69-81. Oct. 1981. SFA 27(1)
[NMFS, Southwest Fish Cent., Monterey, CA 93940]

82-000295 Persat, H. and E. Pattee. THE GROWTH RATE OF YOUNG GRAYLING IN SOME FRENCH RIVERS. *Int. Ver. Theor. Angew. Limnol. Verh.* 21(Part 2):1270-1275. 1981. In English with French summ. SFA 27(1)
[Dep. Biol. Anim., Univ. Claude-Bernard-Lyon-I, 43 bd du 11 novembre, F-69622 Villeurbonne Cedex, France]

82-000296 Pozo, E. EDAD Y CRECIMIENTO DEL PARGO CRIOLLO (*LUTJANUS ANALIS* CUVIER, 1828) EN LA PLATAFORMA NORORIENTAL DE CUBA. [AGE AND GROWTH OF MUTTON SNAPPER (*LUTJANUS ANALIS* CUVIER, 1828) IN THE NORTHEASTERN CUBAN SHELF.] *Riv. Cubana Invest. Pesq.* 4(2):1-24. 1979. In Spanish with English summ. SFA 27(1)
[Cent. Invest. Pesq., Ave. 1ra. y 26, Miramar, Ciudad Habana, Cuba]

82-000297 Prokes, M. SEASONAL GROWTH OF CHUB, LEUCISCUS CEPHALUS, IN THE ROKYTNÁ STREAM. *Folia Zool.* 30(4):371-384. 1981. In English with Russian summ. SFA 27(1)
[Inst. Vert. Zool., Czech. Acad. Sci., Brno, Czechoslovakia] Data are given on the seasonal growth of chub, *Leuciscus cephalus* (Linnaeus, 1758), in the first two years of life. The study was implemented in a section of the Rokytná stream in 1974 through 1976. In total, 3,012 individuals were examined. A high growth intensity was ascertained during the period from May to September. In this period of time the monthly increments in length varied between 0.8 and 7.2mm. The increments in October and April were low (0.8 to 3.1mm), in the winter months negligible to zero (0.0 to 0.8mm). At the end of the 1st year of life the average standard lengths varied in different years of study between 8.6 and 8.9mm and at the end of the 2nd year of life between 32.2 and 34.0mm. The growth in weight and the length-weight relationship were also analysed. Growth data obtained by direct fish measurements were generally lower than the back-calculated growth data resulting from scale reading available in the literature.

82-000298 Protopopov, N. K. THE FORMATION OF SPAWNING RINGS AND SUPPLEMENTARY RINGS ON THE SCALES OF THE PECHORA RIVER WHITEFISH, *COREGONUS LARVARETUS PIDSCHIAN*. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 20(5):38-45. 1980. SFA 27(1)
[North. Dep., PINRO, Arkhangelsk, USSR]

## AGE AND GROWTH (CONTINUED)

82-000299 Tanaka, K.; Y. Mugiya and J. Yamada. EFFECTS OF PHOTOPERIOD AND FEEDING ON DAILY GROWTH PATTERNS IN OTOLITHS OF JUVENILE *TILAPIA NILOTICA*. *NOAA Fish. Bull.* 7(3):459-466. July 1981. SFA 27(1)
[Lab. Physiol. Ecol., Fac. Fish., Hokkaido Univ., Hakodate, Hokkaido 041, Japan] Effects of varying photoperiods and feeding times on the formation of daily rings in otoliths of juvenile *Tilapia nilotica* were studied with a scanning electron microscope. Two alternate concentric zones, each different in structure, were distinguished in the acid-etched ground plane: one thin and appearing as a groove (discontinuous zone ) and the other thick and with well-developed, needlelike crystals (incremental zone). The number of incremental zones showed a good correlation with the chronological age in days after hatching for at least 28 days. The otolith showed a daily rhythm of growth under a photoperiod of 24 hours (12 light-12 dark). Growth of incremental zones started a few hours after lights-on and stopped or slowed down within a few hours of the following lights-on, during which time the discontinuous zone seemed to be formed. When the light and dark cycle was reversed, the cycle of otolith growth began to change on the second day and accommodated to the new photocondition 6 days after the reversal. A change in length of light and dark phases (18L-6D or 6L-18D) or a shift of feeding time did not affect the time of the discontinuous and incremental zone formation.

82-000300 Wańkowski, J. W. J. ESTIMATED GROWTH OF SURFACE-SCHOOLING SKIPJACK TUNA, *KATSUWONUS PELAMIS*, AND YELLOWFIN TUNA, *THUNNUS ALBACARES*, FROM THE PAPUA NEW GUINEA REGION. *NOAA Fish. Bull.* 79(3):517-532. July 1981. SFA 27(1)
[Minist. Conserv., Mar. Sci. Lab., P.O. Box 114, Queenscliff, Victoria 3225, Australia]

## GEOGRAPHICAL DISTRIBUTION, FISH SURVEYS, ETC.

82-000301 Branstetter, S. BIOLOGICAL NOTES ON THE SHARKS OF THE NORTH CENTRAL GULF OF MEXICO. *Contrib. Mar. Sci.* 24:13-34. Sept. 1981. SFA 27(1)
[Dep. Wildl. Fish. Sci., Tex. A&M Univ., College Station 77843]

82-000302 Clark, M. R. PROBABLE ESTABLISHMENT AND RANGE EXTENSION OF THE SPOTTED TILAPIA, *TILAPIA MARIAE* BOULENGER (PISCES: CICHLIDAE) IN EAST CENTRAL FLORIDA. *Fla. Sci.* 44(3):168-171. 1981. SFA 27(1)
[Harbor Branch Found., Inc., RR 1, Box 196, Fort Pierce, FL 33450]

82-000303 Cohen, D. M. NEW AND RARE OPHIDIIFORM FISHES FROM THE EASTERN ATLANTIC: CANARY ISLANDS TO THE CAPE OF GOOD HOPE. *Proc. Biol. Soc. Wash.* 94(4):1085-1103. 31 Dec. 1981. SFA 27(1)
[Syst. Lab., NMFS, Natl. Mus. Natl. Hist., Washington, DC 20560]

82-000304 DeWitt, H. H.; P. A. Grecay; J. S. Hacunda; B. P. Lindsay; R. F. Shaw and D. W. Townsend. AN ADDITION TO THE FISH FAUNA OF THE GULF OF MAINE WITH RECORDS OF RARE SPECIES. *Proc. Biol. Soc. Wash.* 94(3):669-674. Oct. 1981. SFA 27(1)
[Dep. Oceanogr., Univ. Me., Ira C. Darling Cent., Walpole 04573]

82-000305 Gjøsæter, J. and I.-M. Beck. MESOPELAGIC FISH OFF MOZAMBIQUE. *Fiskeridir. Skr. Ser. Havunders.* 17(6):253-265. 1981. SFA 27(1)
[Dep. Fish. Biol., Univ. Bergen, Norway]

## GEOGRAPHICAL DISTRIBUTION, FISH SURVEYS, ETC. (CONTINUED)

82-000306 Gunkel, G. KÖRPERZUSAMMENSETZUNG, WACHSTUM UND NAHRUNGSNUTZUNG VON JUNGEN SANDFELCHEN (*CORGONUS FERA* JURINE) BEI FÜTTERUNG MIT TEICHPLANKTON UND IM HUNGER. [BODY COMPOSITION, GROWTH, AND GROSS GROWTH EFFICIENCY OF YOUNG *COREGONUS FERA* JURINE FED WITH POND ZOOPLANKTON AND UNDER STARVATION CONDITIONS.] *Arch. Hydrobiol.* 92(4):419-456. 1981. In German with English summ. SFA 27(1)
[Tech. Univ. Berlin, Inst. Tech. Umweltsch., Sekr. KF3, Strasse des 17. Juni 135, 1000 Berlin 12, West Germany]

82-000307 Hardy, G. S. NEW RECORDS OF PUFFERFISHES (FAMILY TETRAODONTIDAE) FROM AUSTRALIA AND NEW ZEALAND, WITH NOTES ON *SPHOEROIDES PACHYGASTER* (MÜLLER AND TROSCHEL) AND *LAGOCEPHALUS SCELERATUS* (GMELIN). *Natl. Mus. N.Z. Rec.* 1(20):311-316. 31 Mar. 1981. SFA 27(1)
[Natl. Mus. N.Z., Wellington, New Zealand]

82-000308 Harvey, H. H. FISH COMMUNITIES OF THE LAKES OF THE BRUCE PENINSULA. *Int. Ver. Theor. Angew. Limnol. Verh.* 21(Part 2):1222-1230. 1981. SFA 27(1)
[Zool. Dep., Univ. Toronto, Toronto, ON M5S 1A1, Canada]

82-000309 Hill, L. G.; W. J. Matthews; T. Schene and K. Asbury. NOTES ON FISHES OF GRAND RIVER, CHOUTEAU CREEK, AND PRYOR CREEK, MAYES COUNTY, OKLAHOMA. *Proc. Okla. Acad. Sci.* 61:76-77. 1981. SFA 27(1)
[Dep. Zool., Univ. Okla., Norman 73019]

82-000310 Hoffman, W.; T. H. Fritts and R. P. Reynolds. WHALE SHARKS ASSOCIATED WITH FISH SCHOOLS OFF SOUTH TEXAS. *Northeast Gulf Sci.* 5(1):55-57. Oct. 1981. SFA 27(1)
[Dep. Biol., Univ. South Fla., Tampa 33620]

82-000311 Karaman, I. I. ON THE QUANTITATIVE DISTRIBUTION OF FLYINGFISH OF THE FAMILY EXOCOETIDAE IN THE INDIAN OCEAN. *J. Ichthyol. (Engl. Trans. Vopr. Ikhtiol.)* 20(5):155-157. 1980. SFA 27(1)
[Exp. Construction Bur. Underwater Invest., Sevastopol, USSR]

82-000312 Lanigan, S. H. and C. R. Berry, Jr. DISTRIBUTION OF FISHES IN THE WHITE RIVER, UTAH. *Southwest. Nat.* 26(4):389-393. 20 Nov. 1981. SFA 27(1)
[Utah Coop. Fish. Res. Unit, Utah State Univ., Logan 84322]

82-000313 Macdonald, J. S. and K. Brewer. RANGE EXTENSION OF THE WHITEBAIT SMELT (*ALLOSMERUS ELONGATUS*) IN BRITISH COLUMBIA. *Syesis* 13:209. 1980. SFA 27(1)
[Dep. Zool., Univ. West Ontario, London, ON N6A 5B7, Canada]

82-000314 Magnin, E. BIOÉCOLOGIE DES POISSONS DU TERRITOIRE DE LA BAIE JAMES, QUÉBEC, CANADA. [BIOECOLOGY OF FISH IN THE TERRITORY OF JAMES BAY, QUEBEC, CANADA] *Int. Ver. Theor. Angew. Limnol. Verh.* 21(Part 2):1244-1250. 1981. In French. SFA 27(1)
[Dep. Biol., Univ. Montreal, C.P. 6128, Montreal, PQ, Canada]

82-000315 Matheson, R. E., Jr. THE DISTRIBUTION OF THE FLAGFIN MOJARRA, *EUCINOSTOMUS MELANOPTERUS* (PISCES: GERREIDAE) WITH ECOLOGICAL NOTES ON TEXAS AND FLORIDA POPULATIONS. *Northeast Gulf Sci.* 5(1):63-66. Oct. 1981.

## GEOGRAPHICAL DISTRIBUTION, FISH SURVEYS, ETC. (CONTINUED)

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[Dep. Wildl. Fish. Sci., Tex. A&M Univ., College Station 77843]

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[Div. Fish. Res., CSIRO, P.O. Box 21, Cronulla, N.S.W. 2230, Australia]

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*Glugea stephani* requires temperatures above 15 C for development in juvenile pleuronectid flatfishes in Yaquina Bay, Oregon. The effect of low temperature (10 C) on the development of recently established parasites was tested experimentally in juvenile English sole (*Parophrys vetulus*). Low temperature arrested parasite development, but did not kill the protozoan which resumed development on return to 19-20 C after as long as 42 days at 10 C. No parasites detectable with the light microscope were found in fish examined after 70 days at 10 C. Although most juvenile English sole move permanently from the estuary to cooler ocean waters in the fall and do not contribute to the continuation of the parasite life cycle, the cyle may be maintained by low numbers of English sole that overwinter in the estuary.

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82-000437 Saarikoski, J. and M. Viluksela. INFLUENCE OF pH ON THE TOXICITY OF SUBSTITUTED PHENOLS TO FISH. *Arch. Environ. Contam. Toxicol.* 10(6):747-753. Nov. 1981. SFA 27(1)
[Dep. Zool., Univ. Helsinki, Arkadiankatu 7, SF-00100 Helsinki 10, Finland]

82-000438 Sadler, K. THE TOXICITY OF AMONIA TO THE EUROPEAN EEL (*ANGUILLA ANGUILLA* L.). *Aquaculture* 26(1-2):173-181. Nov. 1981. SFA 27(1)
[C.E.R.L. Freshwater Biol. Unit, Ratcliffe-on-Soar Power Stn., Nottingham NG11 0EE, England] Elvers (mean weight 0.2g) and yellow eels (mean weight 2.8g) were exposed to unionised ammonia ($NH_3$) concentrations up to 22mg-N $l^{-1}$ and their survival monitored over 10 days. Both age classes had a median period of survival in excess of 10 days at concentrations less than 1.0 mg-N $l^{-1}$. Above this level increased mortality occurred with increased ammonia concentration with the elvers being more susceptible than the larger eels. The growth rates of yellow eels were independent of unionised ammonia concentration up to approximately 0.12mg-N $l^{-1}$. Above this level growth rates decreased to near zero at 0.5mg-N $l^{-1}$.

82-000439 Sasaki, K.; M. Takeda and M. Uchiyama. TOXICITY, ABSORPTION AND ELIMINATION OF PHOSPHORIC ACID TRIESTERS BY KILLIFISH AND GOLDFISH. *Bull. Environ. Contam. Toxicol.* 27(6):775-782. Dec. 1981. SFA 27(1)
[Natl. Inst. Hygienic Sci., 18-1 Kamiyoga 1-chome, Setagaya-ku, Tokyo, Japan]

82-000440 Sorensen, E. M. B. and N. K. R. Smith. HEMOSIDERIN GRANULES: CYTOTOXIC RESPONSE TO ARSENIC EXPOSURE IN CHANNEL CATFISH. *Bull. Environ. Contam. Toxicol.* 27(5):645-653. Nov. 1981. SFA 27(1)
[Dep. Pharmacol., Univ. Tex., Austin 78712]

82-000441 Swarup, P. A.; D. M. Rao and A. S. Murty. TOXICITY OF ENDOSULFAN TO THE FRESHWATER FISH *CIRRHINUS MRIGALA*. *Bull. Environ. Contam. Toxicol.* 27(6):850-855. Dec. 1981. SFA 27(1)
[Dep. Zool., Nagarjuna Univ., Nagarjunanagar, S. India 522510]

82-000442 Tsai, C.-F. and K.-Y. Chang. EFFECT OF SEX AND SIZE ON COPPER SUSCEPTIBILITY OF THE COMMON GUPPY, *LEBISTES RETICULATUS* (PETER). *J. Fish Biol.* 19(6):683-689. Dec. 1981. SFA 27(1)
[Tracor Jitco, Inc., Rockville, MD] Multiple regression analyses were conducted to relate rate of toxin action, body weight and concentration for fry, male and female populations of *Lebistes reticulatus* exposed to copper solutions. For each of these three populations, copper susceptibility decreased as body weight increased. On the basis of the rate of toxic action adjusted with the size factor, the copper susceptibility differed significantly among the fry, male and female populations at the ratios of 2.20:1.55:1.00. When the size factor was not included in calculation, the rate of toxic action or median survival time did not show such a difference between the males and females.

## FISH TOXICANTS

82-000443 Gilmore, R. G.; P. A. Hastings; G. R. Kulczycki and B. L. Jennison. CRYSTALLINE ROTENONE AS A SELECTIVE FISH TOXIN. *Fla. Sci.* 44(4):193-203. 1981. SFA 27(1)

## FISH TOXICANTS (CONTINUED)

82-000443 CONTINUED
[Harbor Branch Found., Inc., RR 1, Box 196, Ft. Pierce, FL 33450] Field collections and laboratory bioassay experiments were conducted comparing various rotenone compounds and solutions with regard to their ability to stupefy and kill marine fish. Crystalline rotenone (97% pure rotenone), rotenone resin (42-45% rotenone) and premixed 5% emulsified rotenone solutions were tested as were alcohol, acetone, and Aromatic 150 solvents. Marine fish and invertebrates tested were both effected by emulsified rotenone while crystalline rotenone was more specific for fish and note the marine invertebrates tested. The pure emulsifier, ATLOX 3335 ®, caused fatalities in *Cyprinodon variegatus*.

## RESEARCH AND MANAGEMENT-GENERAL

82-000444 Regier, H. A. OPTIMUM USE, FISHERIES MANAGEMENT. *Fisheries (Bull. Am. Fish. Soc.)* 6(5):4-7. Sept.-Oct. 1981. SFA 27(1)
[Dep. Zool., Univ. Toronto, Toronto, ON, Canada]

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82-000446 Veiluva, M. THE FISH AND WILDLIFE COORDINATION ACT IN ENVIRONMENTAL LITIGATION. *Ecol. Law Q.* 9(3):489-517. 1981. SFA 27(1)

82-000447 Wiley, R. W. THOUGHTS AND REFLECTIONS ON ADMINISTRATION. *Fisheries (Bull. Am. Fish. Soc.)* 6(5):2-4. Sept.-Oct. 1981. SFA 27(1)
[Wyo. Game Fish Dep., Laramie]

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82-000448 Cope, O. B.,(ed.). COLORADO FISHERIES RESEARCH REVIEW 1978-1980. *Colo. Div. Wildl. Rev.* No. 10. viii + 83p. Sept. 1981. SFA 27(1)

82-000449 Scott, D. P. BIENNIAL REPORT - 1976-78, WESTERN REGION, FISHERIES AND MARINE SERVICE, DEPARTMENT OF FISHERIES AND THE ENVIRONMENT. *Can. Tech. Rep. Fish. Aquatic. Sci.* No. 1019. vi + 36p. Oct. 1981. In English and French. SFA 27(1)
[Dep. Fish. Oceans, Winnipeg, MB R3T 2N6, Canada]

82-000450 Sullivan, C. R. THE HISTORY, STRUCTURE, AND FUNCTION OF THE AMERICAN FISHERIES SOCIETY. *Fisheries (Bull. Am. Fish. Soc.)* 6(5):25-29. Sept.-Oct. 1981. SFA 27(1)
[Am. Fish. Soc., 5410 Grosvenor Lane, Bethesda, MD 20014]

# SPORT FISHERY ABSTRACTS

## HABITAT ALTERATIONS

82-000451 Eley, R.; J. Randolph and J. Carroll. A COMPARISION OF PRE- AND POST-IMPOUNDMENT FISH POPULATIONS IN THE MOUNTAIN FORK RIVER IN SOUTHEASTERN OKLAHOMA. *Proc. Okla. Acad. Sci.* 61:7-14. 1981. SFA 27(1)
[Waterways Exp. Stn., Vicksburg, MS] The purpose of this paper is to compare the composition and diversity of fish collections before and after the impoundment of the Mountain Fork River by Broken Bow Dam. The number of species reported has declined from 84 to 65 and diversity is lower after impoundment.

82-000452 Finnell, L. M. RESULTS OF FISHERIES INVESTIGATIONS AT TWIN LAKES, COLORADO 1973-76. *U.S. Dep. Interior Bur. Reclam.* REC-ERC-80-5. vi + 47p. Aug. 1981. SFA 27(1)
[Colo. Div. Wildl., 317 W. Prospect, Fort Collins 80526]

82-000453 Gore, J. A. and Judy, R. D., Jr. PREDICTIVE MODELS OF BENTHIC MACRONINVERTEBRATE DENSITY FOR USE IN INSTREAM FLOW STUDIES AND REGULATED FLOW MANAGEMENT. *Can. J. Fish. Aquatic Sci.* 38(11):1363-1370. Nov. 1981. SFA 27(1)
[Fac. Nat. Sci., Univ. Tulsa, 600 S. College Ave., Tulsa, OK 74104]

## HARVEST, CREEL CENSUS, ETC.

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[NMFS, 75 Virginia Beach Dr., Miami, FL 33149]

82-000455 Juneau, C. L., Jr. and J. F. Pollard. A SURVEY OF THE RECREATIONAL SHRIMP AND FINFISH HARVESTS OF THE VERMILION BAY AREA AND THEIR IMPACT ON COMMERICIAL FISHERY RESOURCES. *La. Dep. Wildl. Fish. Tech. Bull.* No. 33. vii + 40p. July 1981. SFA 27(1)

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[NMFS, Beaufort, NC 28516]

82-000457 Taylor, J. L. and S. D. Reiling. A COMPARISON OF MAINE OPEN WATER AND ICE FISHING ACTIVITIES AND PARTICIPANTS. *Univ. Me. Life Sci. Agric. Exp. Stn. Bull.* 778. 32p. Sept. 1981. SFA 27(1)
[Dep. Zool., Univ. Me., Orono]

## REGULATIONS

82-000458 Holliday, M. C. COMPARATIVE IMPACTS OF FOUR LIMITED ENTRY FISHERY MANAGEMENT POLICIES PROPOSED FOR THE NEW ENGLAND GROUNDFISHERY. *Ph.D. dissertation, Univ. Del.* 388p. 1981. From Diss. Abstr. Int. B Sci.

## REGULATIONS (CONTINUED)

82-000458 CONTINUED Eng. 42(5):1717. Nov. 1981. SFA 27(1)
Four limited entry management policies are examined for use in the New England groundfishery: (1) a fisherman's quota plan, (2) an effort share plan, (3) a license plan, and (4) a landing tax plan. The impacts of the plans on the fishery are predicted and compared on the basis of management operation, socioeconomic effects, biological effectiveness and economic efficiency. Overall, the fisherman's quota plan is superior for the commercial sector in comparison to the other plans and the current management policy. This choice is based on the overall superior ranking of the plan in 13 criteria for judging a management plan, its relative ability to achieve management objectives set by the New England Fishery Management Council, and its potential for increasing economic efficiency in the fisrery. In the recreational groundfishing sector bag limits and mimimum possession size are identified as more suitable management measures than any of the proposed limited entry policies.

## FISH CONTROL AND REMOVAL

82-000459 Hanson, L. H. STERILIZATION OF SEA LAMPREYS (*PETROMYZON MARINUS*) BY IMMERSION IN AN AQUEOUS SOLUTION OF BISAZIR. *Can. J. Fish. Aquatic Sci.* 38(10):1285-1289. Oct. 1981. In English with French summ. SFA 27(1)
[U.S. FWS, Hammond Bay Biol. Stn., Millersburg, MI 49759]

## MARKING AND TAGGING

82-000460 Black, G. A. METAZOAN PARASITES AS INDICATORS OF MOVEMENTS OF ANADROMOUS BROOK CHARR (*SALVELINUS FONTINALIS*) TO SEA. *Can. J. Zool.* 59(10):1892-1896. Oct. 1981. In English with French summ. SFA 27(1)
[Dep. Zool., Coll. Biol. Sci., Univ. Guelph, Guelph, ON N1G 2W1, Canada]

82-000461 Byars, J. TAGGING MORTALITY AND TAG SHEDDING OF JUVENILE GULF MENHADEN, *BREVOORTIA PATRONUS*. *La. Dep. Wildl. Fish. Tech. Bull.* No. 32. ix + 11p. July 1981. SFA 27(1)

## STOCKING AND INTRODUCTIONS

82-000462 Khakimullin, A. A. MORPHOPHYSIOLOGICAL EVALUATION OF THE HATCHERY REARED YOUNG OF THE SIBERIAN STURGEON, *ACIPENSER BAERI*. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 20(5):99-107. 1980. SFA 27(1)
[SibrybNIIproyekt, Tyumen, USSR] The young of the Siberian sturgeon, *Acipenser baeri*, reared under different conditions, are dissimilar in several characters. Underyearlings from ponds with vegetation are considerably larger, the relative weight of their internal organs greater and their hematological indices higher. These young are represented by the most resistant specimens which have survived under unfavorable conditions. The length increase of sturgeon underyearlings outstrips their weight increase, but on the whole their growth is approximately isometric. The most rapid increase in hemoglobin concentration occurs before the young have reached a weight of around 2g, after which the rate at which hemoglobin is accumulated decreases rapidly. The increase in the number of erythrocytes proceeds more evenly. The increase in hemoglobin concentration and in the number of

## STOCKING AND INTRODUCTIONS (CONTINUED)

82-000462 CONTINUED erythrocytes with the increase in body weight, and the increase in hemoglobin concentration with he increase in the number of erythrocytes are described by a equation of the type y=a+blnx.

82-000463 Kircheis, F. W. and J. G. Stanley. THEORY AND PRACTICE OF FORAGE-FISH MANAGEMENT IN NEW ENGLAND. *Trans. Am. Fish. Soc.* 110(6):729-737. Nov. 1981. SFA 27(1)
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82-000464 Li, H. W. and P. B. Moyle. ECOLOGICAL ANALYSIS OF SPECIES INTRODUCTIONS INTO AQUATIC SYSTEMS. *Trans. Am. Fish. Soc.* 110(6):772-782. Nov. 1981. SFA 27(1)
[Oreg. Coop. Fish. Res. Unit., Oreg. State Univ., Corvallis 97331]

82-000465 Mathias, J. A. and M. Papst. GROWTH, SURVIVAL AND DISTRIBUTION OF *GAMMARUS LACTUSTRIS* (CRUSTACEA - AMPHIPODA) STOCKED INTO PONDS. *Can. Tech. Rep. Fish. Aquatic Sci.* No. 989. iv + 11p. Aug. 1981. SFA 27(1)
[West. Reg., Dep. Fish. Oceans, Winnipeg, MB R3T 2N6, Canada] *Gammarus lacustris* was stocked at a density of 411 animals $m^{-2}$ into a 1.8 ha pond with no fish predators. A high mortality rate of 8% $da^{-1}$ was attributed to invertebrate predation. Growth rates and brood sizes of the stocked amphipods were similar to those of the parent population. Sex ratio, body size and reproductive stage of adult *G. lacustris* were biased by the harvest method and therefore differed between the stocked and parent populations. Stocking of *G. lacustris* into ponds as a food organism for fish is feasible if invertebrate predators can be controlled.

82-000466 Ney, J. J. EVOLUTION OF FORAGE-FISH MANAGEMENT IN LAKES AND RESERVOIRS. *Trans. Am. Fish. Soc.* 110(6):725-728. Nov. 1981. SFA 27(1)
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82-000467 Noble, R. L. MANAGEMENT OF FORAGE FISHES IN IMPOUNDMENTS OF THE SOUTHERN UNITED STATES. *Trans. Am. Fish. Soc.* 110(6):738-750. Nov. 1981. SFA 27(1)
[Dep. Wildl. Fish. Sci., Tex. A&M Univ., College Station 77843]

82-000468 Snetkov, M. A. and Yu. S. Reshetnikov. POSSIBLE USE OF A MODIFIED BEVERTON-HOLT RECRUITMENT MODEL TO ESTIMATE THE OPTIMUM STOCKING DENSITY OF LARVAL COREGONIDS. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 20(6):143-146. 1980. SFA 27(1)
[IEMEZh, Moscow, USSR]

82-000469 Wydoski, R. S. and D. H. Bennett. FORAGE SPECIES IN LAKES AND RESERVOIRS OF THE WESTERN UNITED STATES. *Trans. Am. Fish. Soc.* 110(6):764-771. Nov. 1981. SFA 27(1)
[U.S. FWS, Natl. Fish. Cent., Kearneysville, WV 25430]

## FISHING GEAR AND TECHNIQUES

82-000470 Lalancette, L.-M. ELLIPSOIDAL TRAP FOR FRESHWATER MINNOWS AND SUCKERS. *Prog. Fish.-Cult.* 43(4):193-194. Oct. 1981. SFA 27(1)
[Dep. Pure Sci., Univ. Quebec, Chicoutimi, PQ G7H 2B1, Canada]

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82-000471 Levi, E. J. DESIGN AND OPERATION OF A SMALL TWO-BOAT PURSE SEINE. *Estuaries* 4(4):385-387. Dec. 1981. SFA 27(1)
[NMFS, Southeast Fish. Cent., Beaufort Lab. Field Stn., Gulf Breeze, FL 32561] A small purse seine, 250 ft. long and 23 ft. deep, and two 14 ft. purse boats to fish it in shallow estuaries for menhaden (*Brevoortia*) are described. The seine is made of No. 6 nylon in the two wings and heavier No. 15 nylon in the center bunt. Mesh is 1 3/8 in. bar. Purse boats have a 7 ft. beam and 2 ft. of freeboard, and are built of 1/4 in. marine plywood and seasoned oak ribs. A 40 hp outboard motor mounted in a center well powers each boat. Boats and seine are portable (on trailers) and can be used any place where launching sites are available. Over 40,000 menhaden were caught and marked with internal ferro-magnetic tags over a 3-year period. Boats and seine also could be used to capture other schooling species.

82-000472 Olson, D. A. and J. A. LaPlace. DEMONSTRATION OF ADVANCES IN VIRGIN ISLANDS SMALL BOAT FISHING TECHNIQUES. *Mar. Fish. Rev.* 43(11):11-15. Nov. 1981. SFA 27(1)
[Dep. Conserv. Cult. Off., P.O. Box 2755, Charlotte Amalie, St. Thomas, Virgin Islands]

82-000473 Regis, J.; E. Pattee and J. D. Lebreton. A NEW METHOD FOR EVALUATING THE EFFICIENCY OF ELECTRIC FISHING. *Arch. Hydrobiol.* 93(1):68-82. 1981. SFA 27(1)
[Dep. Biol. Anim. Ecol., Univ. Claude Bernard-Lyon I, 43 bd du 11 Novembre 1918, F-69622 Villeurbanne Cedex, France]

82-000474 Seki, H.; A. Hamada; T. Iwami and R. J. LeBrasseur. HOBIKIAMI SAIL TRAWLING IN JAPAN. *Fisheries (Bull. Am. Fish. Soc.)* 6(6):2-15. Nov.-Dec. 1981. SFA 27(1)
[Dep. Biol. Sci., Univ. Tsukuba, Sakuramura, Ibaraki, Japan]

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[Marquette Fish. Res. Stn., Mich. Dep. Nat. Resour., 484 Cherry Creek Rd., Marquette 49855]

## FERTILIZATION OF SOIL AND WATER

82-000476 Simpson, K.; L. Hop Woo and I. Miki. FISH SURVEYS OF 15 SOCKEYE SALMON (*ONCORHYNCHUS NERKA*) NURSERY LAKES IN BRITISH COLUMBIA. *Can. Tech. Rep. Fish Aquatic Sci.* no. 1022. v + 87p. July 1981. In English with French summ. SFA 27(1)
[Dep. Fish. Oceans, Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada]

## FISHWAYS, FISH PASSAGE THROUGH DAMS, ETC.

82-000477 Smith, D.; I. Kornfield and B. Goodwin. REMOTELY OPERATED TRAP FOR CAPTURE OF TERRITORIAL FISHES. *Prog. Fish.-Cult.* 43(4):208-209. Oct. 1981. SFA 27(1)
[Migratory Fish Res. Inst., Univ. Me., Orono 94469]

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82-000478 Turnpenny, A. W. H. AN ANALYSIS OF MESH SIZES REQUIRED FOR SCREENING FISHES AT WATER INTAKES. *Estuaries* 4(4):363-368. Dec. 1981. SFA 27(1)
[Cent. Elect. Res. Lab., Mar. Biol. Lab., Fawley, Southampton, Hampshire SO4 1TW, England]

## MATHEMATICS, STATISTICAL METHODS, AND MODELING

82-000479 Agnello, R. J. and L. G. Anderson. PRODUCTION RESPONSES FOR MULTI-SPECIES FISHERIES. *Can. J. Fish. Aquatic Sci.* 38(11):1393-1404. Nov. 1981. SFA 27(1)
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82-000480 Otero, H. O. and D. R. Hernandez. DISEÑO DE UN MUESTREO ESTRATIFICADO PARA EL MONITOREO DEL STOCK DE MERLUZA COMÚN (*MERLUCCIUS HUBBSI*). [DESIGN OF A STRATIFIED RANDOM SAMPLING TO MONITOR THE STOCK OF COMMON HAKE (*MERLUCCIUS HUBBSI*).] *Argentina Inst. Nac. Invest. Desar Pesq. Contrib.* no. 361. 10p. July 1981. In Spanish with English summ. SFA 27(1)
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82-000481 Stocker, M. and R. Hilborn. SHORT-TERM FORECASTING IN MARINE FISH STOCKS. *Can. J. Fish. Aquatic Sci.* 38(10):1247-1254. Oct. 1981. In English with French summ. SFA 27(1)
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82-000482 Wild, A. AN INVESTIGATION OF FISHERIES YIELD EQUATIONS WITH PARTICULAR REFERENCE TO ANNUAL STATE MODELS AND SEASONAL PULSE FISHING. *Ph.D. dissertation, Univ. British Columbia* 1981. From Diss. Abstr. Int. B Sci. Eng. 42(6):2264. Dec. 1981. SFA 27(1)

## LAKE MANAGEMENT AND RESEARCH

82-000483 Gunn, J. M. and W. Keller. EMERGENCE AND SURVIVAL OF LAKE TROUT (*SALVELINUS NAMAYCUSH*) AND BROOK TROUT (*S. FONTINALIS*) FROM ARTIFICAL SUBSTRATES IN AN ACID LAKE. *Ontario Fish. Tech. Rep. Ser.* No. 1. iii + 9p. 1981. SFA 27(1)
[Ontario Minist. Nat. Resour., Sudbury, ON P3A 4S2, Canada] Eyed eggs of lake trout (*Salvelinus namaycush*) and brook trout (*S. fontinalis*) were incubated overwinter in crushed limestone and mixed noncalcareous gravel substrates in the acidic waters (pH 5.2) of George Lake. Alevin emergence for both species (33.6-73.0%) was generally good for limestone substrates (interstitial water pH > 6) and almost nonexistent (0.1-1.3%) from mixed gravel substrates (interstitial water pH 5.5). Survival of alevins of both species hatched in limestone was high during 7-d holding periods in both the acidic lake (70.0-100.0%) and at a control site in the near-neutral waters of Killarney Bay (89.5-100). High alevin mortality observed after 30 d of an extended (41-d) exposure in George Lake appeared related to feeding and containment problems rather than pH toxicity. The substantial alevin emergence from limestone and the high survival during 7-d and 30-d holding periods indicate that small scale limestone applications to

## LAKE MANAGEMENT AND RESEARCH (CONTINUED)

82-000483 CONTINUED provide spawning substrates would enhance salmonid recruitment in some acidic lakes.

82-000484 Thorne, R. E. and G. L. Thomas. HYDROACOUSTIC SURVEYS OF FISH ABUNDANCE AND DISTRIBUTION IN TWIN LAKES, COLORADO. *U.S. Dep. Interior Water Power Resour. Serv.* REC-ERC-81-4. v + 14p. Apr. 1981. SFA 27(1)
[Fish. Res. Inst., Coll. Fish., Univ. Wash., Seattle] Hydroacoustic surveys were conducted on Twin Lakes, Colorado, during September 1980 in order to measure the size and distribution of the resident fish population. Two distinct size groups of fish were observed: large fish below the thermocline (about 12 m) and small fish in the epilimnion. Net samples indicated that the large fish were predominately lake trout. Their estimated population size was 14,600, with 95% confidence limits of 4,100 to 25,000. The relatively large confidence intervals were the result of the relatively low fish density and its contagious distribution. The small fish were not identified, but may have been juvenile lake trout. Population estimates of this group were not made because of extreme patchiness and undersampling by the survey procedures, which focused on the larger fish.

## RIVER AND STREAM MANAGEMENT AND RESEARCH

82-000485 Mih, W. C. and G. C. Bailey. THE DEVELOPMENT OF A MACHINE FOR THE RESTORATION OF STREAM GRAVEL FOR SPAWNING AND REARING OF SALMON. *Fisheries (Bull. Am. Fish. Soc.)* 6(6):16-20. Nov.-Dec. 1981. SFA 27(1)
[Albrook Hydraul. Lab., Dep. Civ. Environ. Eng., Univ. Wash., Pullman]

82-000486 Wahle, R. J. and E. Chaney. ESTABLISHMENT OF NONINDIGENOUS RUNS OF SPRING CHINOOK SALMON, *ONCORHYNCHUS TSHAWYTSCHA*, IN THE WIND RIVER DRAINAGE OF THE COLUMBIA RIVER, 1955-63. *NOAA Fish. Bull.* 79(3):507-516. July 1981. SFA 27(1)
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82-000487 Winterbourn, M. J.; J. S. Rounick and B. Cowie. ARE NEW ZEALAND STREAM ECOSYSTEMS REALLY DIFFERENT? *N.Z. J. Mar. Freshwater Res.* 15(3):321-328. 1981. SFA 27(1)
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## FARM POND AND SMALL IMPOUNDMENT MANAGEMENT AND RESEARCH

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82-000489 Lusk, S. DEVELOPMENT OF THE FISH POPULATION IN THE MUŠOV RESERVOIR IN THE FIRST YEAR AFTER FILLING. *Folia Zool.* 30(3):249-261. 1981. In English with Russian summ. SFA 27(1)
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82-000490 Quiros, R. EVALUACION DEL RENDIMIENTO PESQUERO POTENCIAL DE EMBALSE DE SALTO GRANDE. [ESTIMATE OF FISHERY YIELD POTENTIAL FOR THE SALTO GRANDE RESERVOIR (31°S - 58°W).] *Argentina Inst. Nac. Invest. Desar. Pesq. Contrib.* No. 395. 18p. 1980. In Spanish with English summ. SFA 27(1)
[Nac. Invest. Desar. Pesq., Casilla de Correo 175, 7600 Mar del Plata, Argentina]

82-000491 Yahnke, J. W. WATER QUALITY OF THE PROPOSED NORDEN RESERVOIR, NEBRASKA, AND ITS IMPLICATIONS FOR FISHERY MANAGEMENT. *U.S. Dep. Interior Bur. Reclam.* REC-ERC-81-8. v + 50p. May 1981. SFA 27(1)
[U.S. Dep. Interior, Bur. Reclam., Reg. Environ. Aff. Off., Lower Mo. Reg., Denver, CO]

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[1000 Rue Cortou, Slidell, LA 70458]

82-000493 Leaney, A. J. and S. Morris. THE BELLA COOLA RIVER ESTUARY STATUS OF ENVIRONMENTAL KNOWLEDGE TO 1981. REPORT OF THE ESTUARY WORKING GROUP FISHERIES AND OCEANS/ENVIRONMENT JOINT CO-ORDINATING COMMITTEE ON ENVIRONMENTAL AFFAIRS PACIFIC AND YUKON REGION. *Can. Dep. Fish. Oceans Spec. Estuary Ser.* No. 10. xxxiv + 260p. 31 Mar. 1981. SFA 27(1)
[Dep. Fish. Oceans, 4160 Marine Dr., West Vancouver, BC V7V 1N6, Canada]

## MARINE MANAGEMENT AND RESEARCH

82-000494 Matsumoto, W. M.; T. K. Kazama and D. C. Aasted. ANCHORED FISH AGGREGATING DEVICES IN HAWAIIAN WATERS. *Mar. Fish. Rev.* 43(9):1-13. Sept. 1981. SFA 27(1)
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# AUTHOR INDEX

Aasted, D. C.
82-000494
Abbas, L. E.
82-000456
Adamek, Z.
82-000265
Addison, R. F.
82-000428
Agnello, R. J.
82-000479
Aimar, C.
82-000137
Al-Habbib, O. A. M.
82-000082
Albrecht, H.
82-000174
Albright, J. T.
82-000132
Alderman, D. J.
82-000364
Alevizon, W. S.
82-000178
Allen, G. H.
82-000006
Allen, W. V.
82-000006
Alvarez-Lajonchere, L.
82-000237
Amidan, G.
82-000036
Amirkhanov, G. A.
82-000083
Anderson, L. G.
82-000479
Anderson, M.
82-000378
82-000379
Anderson, W. D., Jr.
82-000332
Aoki, M.
82-000185
Appy, R. G.
82-000380
Arieli, Y.
82-000036
Arillo, A.
82-000421
Arnold, C. R.
82-000054
82-000330
Asbury, K.
82-000309
Austin, B.
82-000364
Avault, J. W., Jr.
82-000043
Ayles, G. B.
82-000019
82-000020
Azuma, M.
82-000207
Bailey, G. C.
82-000485
Bakanov, A. I.
82-000279
Balushkin, A. V.
82-000337
Banarescu, P. M.
82-000349
Banerji, S. R.
82-000238
Barton, B. A.
82-000422
Bartoo, R.
82-000328
Barus, V.
82-000084
Bateman, D.
82-000320
Bath, H.
82-000333
82-000334
Bauer, J. A., Jr.
82-000239
Bauer, S. E.
82-000239
Beamish, F. W. H.
82-000412
Beardsley, G. L.
82-000216
Beck, I.-M.
82-000305
Beitinger, T. L.
82-000177
82-000411
Bekker, V. E.
82-000335
Benditt, E. P.
82-000427
Bennett, D. H.
82-000469
Benson, N. G.
82-000492
Berry, C. R., Jr.
82-000312
Berti, R.
82-000181
Beverley-Burton, M.
82-000381
Bhaskar, M.
82-000431
Bielek, E.
82-000085
Billard, R.
82-000086
Bird, D. J.
82-000087
Birnie, S. E.
82-000392
Biswas, N.
82-000136
Blaber, S. J. M.
82-000044
Black, G. A.
82-000460
Blake, R. L.
82-000003

# AUTHOR INDEX

**Blanc, J. M.**
82-000158
**Blaxter, J. H. S.**
82-000175
82-000176
**Blouw, D. M.**
82-000045
**Bond, J.**
82-000427
**Borgstrom, R.**
82-000270
**Borodulina, O. D.**
82-000335
**Bosch, H.**
82-000108
**Braekkan, O. R.**
82-000145
**Braid, M. R.**
82-000013
**Branstetter, S.**
82-000301
**Brege, D. A.**
82-000285
**Brewer, K.**
82-000313
**Brooks, D. R.**
82-000386
**Browder, J. A.**
82-000454
**Brown, J. A.**
82-000336
**Brusher, H. A.**
82-000099
**Brusven, M. A.**
82-000266
**Buckley, J. T.**
82-000090
**Burns, J. R.**
82-000051
**Burt, M. D. B.**
82-000382
**Burton, D. T.**
82-000436
**Buschbom, R. L.**
82-000159
**Butler, J. L.**
82-000068
**Butskaya, N. A.**
82-000088
**Butterworth, B. C.**
82-000406
**Buttner, J. K.**
82-000015
**Byars, J.**
82-000461
**Calhoun, S. W.**
82-000177
**Campagna, C. G.**
82-000089
**Campbell, J.**
82-000367
**Campbell, R. A.**
82-000387
**Cardeilhac, P. T.**
82-000420
**Cardenette, G.**
82-000131
**Carlberg, G. E.**
82-000433
**Carling, P. A.**
82-000256
**Carmack, E. C.**
82-000040
**Carr, W. E.**
82-000420
**Carroll, J.**
82-000451
**Carter, J. S.**
82-000377
**Casterlin, M. E.**
82-000196
**Castledine, A. J.**
82-000090
**Cech, J. J., Jr.**
82-000089
**Chan, G.**
82-000373
**Chandra, K.**
82-000022
**Chaney, E.**
82-000264
82-000486
**Chang, K.-Y.**
82-000442
**Chapman, D. J.**
82-000396
82-000404
82-000415
82-000416
**Chase, R.**
82-000093
**Chebanov, N. A.**
82-000240
**Chen, C.**
82-000241
**Chereshnev, I. A.**
82-000337
**Chernoff, B.**
82-000338
**Chien, Y.-H.**
82-000043
**Chittenden, M. E., Jr.**
82-000148
**Cho, C. Y.**
82-000408
**Christie, A. E.**
82-000393
**Chubb, C. F.**
82-000286
**Cianfanelli, A.**
82-000181
**Ciechomski, J. D. de**
82-000242
82-000243
**Cipriano, R. C.**
82-000365

## AUTHOR INDEX

Clady, M. D.
82-000267
Clark, M. R.
82-000302
Clarke, A.
82-000256
Cloutman, D. G.
82-000374
Coad, B. W.
82-000339
Cohen, D. M.
82-000303
Cole, W. C.
82-000091
Coleman, F.
82-000092
Colgan, P. W.
82-000336
Collins, J. P.
82-000327
Colton, D. E.
82-000178
Comas, J. P.
82-000495
Cone, D. K.
82-000382
82-000383
Conner, J. R.
82-000496
Conroy, D. A.
82-000362
Cooper, M.
82-000227
Cooper, M. J.
82-000221
Cope, O. B.
82-000448
Corazza, L.
82-000047
Cottle, J.
82-000385
Cowie, B.
82-000487
Coyer, J. A.
82-000180
Crane, J. M., Jr.
82-000208
Crateau, E. J.
82-000209
Cresswell, G. R.
82-000316
Crowder, L. B.
82-000282
Cyrus, D. P.
82-000044
Dalela, R. C.
82-000418
Daley, R. J.
82-000040
Damianakis, H.
82-000170
Darcy, G. H.
82-000268
Dauble, D. D.
82-000159
Davis, J. C.
82-000454
Davis, R. E.
82-000093
Davison, W.
82-000046
Day, M. H.
82-000179
De Martini, E. E.
82-000180
82-000244
Dean, J. M.
82-000253
Deelder, C. L.
82-000287
Demina, A. G.
82-000288
Denton, E. J.
82-000175
Detollenaere, A.
82-000407
DeWitt, H. H.
82-000304
Dill, L. M.
82-000269
Dindo, J. J.
82-000123
Dixon, D. G.
82-000423
Djabali, M.
82-000094
Dominguez, R.
82-000293
Donaldson, E. M.
82-000007
82-000008
82-000009
82-000429
Dooley, J. K.
82-000340
Dorofeyeva, Ye. A.
82-000341
Doucette, A. J., Jr.
82-000162
Douglas, W. A.
82-000230
Dowling, R. M.
82-000320
Drangsholt, H.
82-000433
Druzhinin, A. D.
82-000210
Dunn, J. F.
82-000046
Dye, H. M.
82-000007
82-000008
82-000009
82-000429
Eales, J. G.
82-000095

## AUTHOR INDEX

Economidis, P. S.
82-000170
Edwards, T. J.
82-000211
82-000399
Edwards, T. W.
82-000096
Egusa, S.
82-000388
Ehrlich, M. D.
82-000242
82-000243
Eie, J. A.
82-000270
Eley, R.
82-000451
Elger, M.
82-000097
Elliott, S. T.
82-000328
Ellis, M. J.
82-000098
Elovenko, V. N.
82-000342
Elston, R.
82-000047
Engelman, R. W.
82-000384
Ercolini, A.
82-000181
Eriksson, L.-O.
82-000160
Esquerda, J. E.
82-000149
Ezeasor, D. N.
82-000048
Ezzi, I. A.
82-000212
Fable, W. A., Jr.
82-000054
82-000099
Fadeyeva, T. A.
82-000245
Farlinger, S. P.
82-000318
Farwell, C. J.
82-000038
Fausch, K. D.
82-000182
Favaretto, A. L. V.
82-000100
Fechhelm, R. G.
82-000107
Ferguson, M. M.
82-000161
Ferraris, C. J., Jr.
82-000317
Ferri, S.
82-000049
Finnegan, J., Jr.
82-000099
Finnell, L. M.
82-000452
Finucane, J. H.
82-000123
Fischer, J. M.
82-000394
Fisher, J. W.
82-000426
Fitzsimons, J. M.
82-000162
Flanagan, C. A.
82-000183
Fletcher, G. L.
82-000106
Flores, J. A.
82-000051
Fouche, L.
82-000016
Fountain, R. K.
82-000244
Francis, M. P.
82-000050
82-000246
Frank, K. T.
82-000329
Frankel, J. S.
82-000101
Fraser, A. H. G.
82-000269
Fritts, T. H.
82-000310
Fritzsche, R. A.
82-000343
Fuller, R. L.
82-000399
Gafford, G. M.
82-000014
Gagliardi, J.
82-000041
Gajdusek, J.
82-000289
Galassi, S.
82-000395
Gandolfi, G.
82-000395
Garcia, M.
82-000131
Garton, J. S.
82-000211
Gascon, D.
82-000222
Genin, M.
82-000407
Geraudie, J.
82-000424
Gerking, S. D.
82-000233
Gery, J.
82-000360
Ghittino, P.
82-000002
Gibson, D. I.
82-000385
Gibson, R. N.
82-000212

# AUTHOR INDEX

Gilmore, R. G.
  82-000257
  82-000443
Giovanardi, O.
  82-000023
Girard, J.-P.
  82-000094
Girsa, I. I.
  82-000102
Gjosaeter, J.
  82-000223
  82-000305
Godbout, R.
  82-000330
Goldberg, S. R.
  82-000247
Goldspink, C. R.
  82-000290
Goncharov, B. F.
  82-000103
Goodwin, B.
  82-000477
Gordon, M. S.
  82-000396
  82-000404
  82-000415
  82-000416
Gore, J. A.
  82-000453
Govindappa, S.
  82-000431
Grabner, M.
  82-000028
Grant, C. J.
  82-000286
Grant, W. S.
  82-000163
  82-000163
Gray, C. B. J.
  82-000040
Gray, J. A. B.
  82-000175
Grecay, P. A.
  82-000304
Gress, F.
  82-000232
Grier, H. J.
  82-000051
Griffin, B. R.
  82-000365
Grimes, P. J.
  82-000052
Griswold, C. A.
  82-000397
Guerra Padron, F.
  82-000084
Gunkel, G.
  82-000306
Gunn, J. M.
  82-000483
Guppy, M.
  82-000046
Hacunda, J. S.
  82-000304
Hagen, D. W.
  82-000045
Haines, T. A.
  82-000398
Hamada, A.
  82-000474
Hamilton, S. J.
  82-000053
  82-000104
Hamman, R. L.
  82-000017
  82-000039
Hamme, R. E.
  82-000377
Hampl, A.
  82-000056
Hansen, F.
  82-000011
Hansen, H. O.
  82-000105
Hanson, L. H.
  82-000459
Harbison, G. R.
  82-000271
Hardy, G. S.
  82-000307
Harrell, R. D.
  82-000374
  82-000399
Harvey, H. H.
  82-000308
  82-000413
Hastings, P. A.
  82-000443
Hatakeyama, S.
  82-000419
Hayama, K.
  82-000205
Heitmuller, P. T.
  82-000425
Helfman, G. S.
  82-000184
Helfrich, H.
  82-000422
Hendrix, M. A.
  82-000031
Hentschel, H.
  82-000097
Hernandez, D. R.
  82-000480
Hew, C. L.
  82-000106
Hibiya, T.
  82-000138
Higler, L. W. G.
  82-000400
Hilborn, R.
  82-000481
Hildebrand, A. C.
  82-000359
Hill, L. G.
  82-000309
Hilton, J. W.
  82-000423

## AUTHOR INDEX

Hioki, S.
82-000076
82-000219
Hirose, K.
82-000153
Hochachka, P. W.
82-000046
Hocutt, C. H.
82-000401
Hodges, D. J.
82-000392
Hodson, R. G.
82-000107
Hoese, D. F.
82-000317
Hoffman, S. G.
82-000198
Hoffman, W.
82-000310
Hogendoorn, H.
82-000108
Holliday, M. C.
82-000458
Hollister, T. A.
82-000425
Holt, J.
82-000054
82-000330
Hop Woo, L.
82-000476
Horikawa, M.
82-000283
Hoss, D. E.
82-000176
Hotopp, W.
82-000109
Houston, A. H.
82-000114
Howell, J.
82-000327
Howes, G.
82-000344
Hughes, S. G.
82-000029
Huish, M. T.
82-000014
Humphries, J. M., Jr.
82-000345
Hunt, T. P.
82-000426
Hunter, G. A.
82-000007
82-000008
82-000009
Hunter, J. R.
82-000217
Iida, K.
82-000498
Ikeda, S.
82-000205
Inada, Y.
82-000369
82-000372
Inamura, O.
82-000283
Inoue, M.
82-000185
International Council for the Exploratio
of the Sea
82-000402
Ishihara, S.
82-000366
Ito, S.
82-000055
Iwamatsu, T.
82-000135
Iwami, T.
82-000474
Jagoe, C. J.
82-000003
Jain, M.
82-000418
Jakle, M. D.
82-000501
Jankowsky, H. D.
82-000109
Janssen, J.
82-000271
Jasper, S.
82-000040
Jennison, B. L.
82-000443
Jensen, A. L.
82-000224
Jirasek, J.
82-000056
Johansson, H.
82-000160
Johnson, A. G.
82-000054
Johnson, K. L.
82-000406
Johnston, C. E.
82-000110
Johnston, I. A.
82-000130
Jones, J. R.
82-000053
82-000104
Joshi, S. B.
82-000106
Judy, R. L., Jr.
82-000453
Juneau, C. L., Jr.
82-000455
Jurss, K.
82-000030
Kabata, Z.
82-000375
Kagawa, H.
82-000111
Karakousis, J.
82-000170
Karaman, I. I.
82-000311
Karpov, A. K.
82-000112

# AUTHOR INDEX

Karr, J. R.
82-000403
Kashiwagi, S.
82-000371
Kasuga, S.
82-000419
Katayama, T.
82-000037
82-000156
Kaufman, B.
82-000093
Kawai, K.
82-000369
82-000372
Kawasaki, L. Y.
82-000396
82-000404
82-000415
82-000416
Kazama, T. K.
82-000494
Keen, W. H.
82-000041
Keller, W.
82-000483
Kelly, P. R.
82-000232
Kelso, B. W.
82-000186
82-000187
Kemp, A.
82-000018
Kerby, J. H.
82-000014
Kesbeke, F.
82-000155
Keyes, R. S.
82-000204
Khakimullin, A. A.
82-000462
Khan, R. A.
82-000367
Killcreas, W.
82-000016
Kim, Ye. D.
82-000157
Kimura, T.
82-000368
Kircheis, F. W.
82-000463
Kitchell, J. F.
82-000282
Klauda, R. J.
82-000405
Klyashtorin, L. V.
82-000113
Klyukanov, V. A.
82-000341
Knudsen, J.
82-000105
Kobayashi, K.
82-000076
Kocan, R. M.
82-000427
Kochkin, P. N.
82-000291
Konchina, Yu. V.
82-000272
Kondo, H.
82-000143
Konosu, S.
82-000128
Kornfield, I.
82-000164
82-000477
Kornilova, G. N.
82-000273
Koss, T. F.
82-000114
Kothbauer, H.
82-000115
Kracht, R.
82-000213
Krajnovic-Ozretic, M.
82-000057
Kramer, D. L.
82-000116
Kraul, S.
82-000024
Kroll, W.
82-000248
Krylova, V. D.
82-000165
Kuehl, D. W.
82-000406
Kulczycki, G. R.
82-000443
Kumar, S.
82-000434
Kusuda, R.
82-000366
82-000369
82-000372
Kux, Z.
82-000058
Kuz'mina, V. V.
82-000117
Kuznetsov, A. A.
82-000103
Kuznetsov, V. A.
82-000331
Lackner, R.
82-000028
Lalancette, L.-M.
82-000470
Landolt, M. L.
82-000427
Lang, I.
82-000059
Lanigan, S. H.
82-000312
Lapin, Yu. Ye.
82-000102
LaPlace, J. A.
82-000472
Lasker, R.
82-000217

## AUTHOR INDEX

...CONTINUED...
Lasker, R.
82-000499
Lasta, C. A.
82-000242
82-000243
Lauder, G. V.
82-000060
Laudien, H.
82-000249
Laurs, R. M.
82-000499
Lavrova, Ye. A.
82-000133
Law, F. C. P.
82-000428
Layher, W. G.
82-000292
Layton, M.
82-000502
Leaney, A. J.
82-000493
Lear, H.
82-000367
Leatherland, J. F.
82-000119
LeBrasseur, R. J.
82-000474
Lebreton, J. D.
82-000473
Leggett, W. C.
82-000329
Leknes, I. L.
82-000061
Lemm, C. A.
82-000031
Lenanton, R. C. J.
82-000286
Leonard, E. N.
82-000406
Leong T. S.
82-000363
Leray, C.
82-000120
Lesel, R.
82-000118
Lethbridge, R. C.
82-000062
Levi, E. J.
82-000471
Lewis, G. E.
82-000225
82-000488
Lewis, R. E.
82-000070
Li, H. W.
82-000464
Li, S.
82-000019
82-000020
Libosvarsky, J.
82-000058
82-000063
82-000084
Lidgerding, B. C.
82-000365
Liem, K. F.
82-000060
Lin W. L.
82-000032
Lincoln, R. F.
82-000166
Lindsay, B. P.
82-000304
Lisovenko, L. A.
82-000250
Litvinenko, N. I.
82-000064
Liu, J. K.
82-000032
Liu, X. Z.
82-000032
Livingston, J. M.
82-000426
Lobel, P. S.
82-000346
Lodenius, M.
82-000409
Lopes, R. A.
82-000100
Love, M. S.
82-000214
Luecke, C.
82-000274
Luempert, L. G. III
82-000167
Luk'yanenko, V. I.
82-000133
Lundberg, B.
82-000275
Lundqvist, H.
82-000160
Lusk, S.
82-000489
Luts, G. I.
82-000121
Maccioni, R. B.
82-000122
Macdonald, J. S.
82-000313
Maceina, M. J.
82-000001
MacGregor, R. III
82-000123
MacKenzie, K.
82-000385
Maeda, T.
82-000255
Magnin, E.
82-000314
Mais, K. F.
82-000226
Majkowski, J.
82-000124
Makeyeva, A. P.
82-000065
Makino, Y.
82-000283

# AUTHOR INDEX

Malhotra, J. C.
82-000022
Mallicoate, D. L.
82-000294
Maloiy, G. M. O.
82-000046
Malueg, K. W.
82-000414
Manooch, C. S. III
82-000456
Margiocco, C.
82-000421
Mari, A.
82-000293
Marliave, J. B.
82-000025
82-000033
Marsal, J.
82-000149
Marsh, A. C.
82-000260
Marshall, J.
82-000277
Marshall, K. E.
82-000502
Marshall, W. S.
82-000125
82-000126
Martin, F. D.
82-000227
Maruyama, T.
82-000251
Matheson, R. E., Jr.
82-000315
Mathias, J. A.
82-000465
Mathisen, O. A.
82-000228
Matsubara, J. A.
82-000188
Matsuda, T.
82-000371
Matsumiya, M.
82-000129
Matsumoto, W. M.
82-000494
Matsuzaki, K.
82-000283
Mattheeuws, A.
82-000407
Matthews, W. J.
82-000309
Maxwell, J. G. H.
82-000316
Mayer, F. L.
82-000053
82-000104
Mayes, M. A.
82-000386
Mazeaud, F.
82-000189
McBride, J. R.
82-000429
McCrone, L. E.
82-000276
McCune, A. R.
82-000066
McEachran, J. D.
82-000355
McKaye, K. R.
82-000190
Medved, R. J.
82-000277
Mehegan, J. P.
82-000116
Mehrle, P. M.
82-000053
82-000104
Mellado, W.
82-000122
Melodia, F.
82-000421
Mensi, P.
82-000421
Metallov, G. F.
82-000133
Meunier, F. J.
82-000067
Meyer, M. K.
82-000347
Micha, J.-C.
82-000407
Michel, C.
82-000370
Michibata, H.
82-000127
82-000430
Middaugh, D. P.
82-000252
82-000253
Mih, W. C.
82-000485
Miki, I.
82-000476
Miki, W.
82-000128
Miller, D. W.
82-000500
Miller, J. S.
82-000496
Miller, L. E.
82-000374
Miller, P. J.
82-000348
Miller, R. A.
82-000222
Minckley, W. L.
82-000327
Mirza, M. R.
82-000349
Miyashita, A.
82-000185
Miyazaki, C.
82-000203
Mochizuki, A.
82-000129

## AUTHOR INDEX

Mokady, S.
82-000036
Mokhtar, A. S. bin
82-000363
Moller, P.
82-000191
Monroe, R. J.
82-000107
Montgomery, W. L.
82-000012
Moon, P. A.
82-000209
Moon, T. W.
82-000130
Morales, J.
82-000362
Morata, P.
82-000131
Moreau, G.
82-000254
Morgan, D. A.
82-000364
Moring, J. R.
82-000003
Moriwaki, S.
82-000199
82-000200
Morris, J.
82-000093
Morris, R. G.
82-000225
Morris, S.
82-000493
Morris, S. M.
82-000132
Moser, H. G.
82-000068
82-000217
Moyle, P. B.
82-000464
Mugiya, Y.
82-000299
Mukhacheva, V. A.
82-000350
Munroe, T. A.
82-000387
Munshi, J. S. D.
82-000136
Murachi, S.
82-000199
82-000200
Murdy, E. O.
82-000317
Murthy, V. K.
82-000431
Murty, A. S.
82-000441
Naftel, G.
82-000202
Nagahama, Y.
82-000111
82-000154
Nagai, A.
82-000080
Nagasawa, K.
82-000388
Nagtegaal, D.
82-000321
Nagtegaal, D. A.
82-000318
Naiman, R. J.
82-000012
Nakamura, Y.
82-000419
Nakatani, T.
82-000255
Nalbant, T. T.
82-000349
National Academy of Sciences
82-000034
Natochin, Yu. V.
82-000133
Naughton, S. P.
82-000278
Nelson, D. O.
82-000192
Nelva, A.
82-000319
Neves, R. J.
82-000261
Ney, J. J.
82-000466
Nickum, J. G.
82-000029
82-000047
Nicol, J. A. C.
82-000055
82-000389
Niimi, A. J.
82-000408
Nikol'skiy, V. N.
82-000236
Nilsson, N.
82-000193
Nishi, K.
82-000134
Nishimura, M.
82-000203
Noakes, D. L. G.
82-000161
Noble, R. L.
82-000467
Noda, K.
82-000283
Northcote, T. G.
82-000186
82-000187
82-000193
Nose, Y.
82-000241
Novikov, G. G.
82-000112
Nuorteva, P.
82-000409
Nuorteva, S.-L.
82-000409
Nuti, R. N.
82-000119

## AUTHOR INDEX

Nyman, H.-G.
82-000432
O'Brien, W. J.
82-000274
O'Grady, K. T.
82-000410
O'Neil, P. E.
82-000215
Ofstad, E. B.
82-000433
Ogawa, T.
82-000200
Oguri, M.
82-000069
Ohta, T.
82-000135
Ohta, Y.
82-000203
Ojha, J.
82-000136
Okita, J.
82-000419
Olivereau, J. M.
82-000137
Olivereau, M.
82-000137
Olmsted, L. L.
82-000070
82-000211
Olsen, D. A.
82-000472
Olsen, H. F.
82-000320
Olson, R. E.
82-000376
Ono, S.
82-000080
Ooga, S.
82-000185
Oshiro, T.
82-000138
Ostermann, W.
82-000322
Otero, H.
82-000495
Otero, H. O.
82-000480
Ottaway, E. M.
82-000256
Otwell, W. S.
82-000139
Pacchetti, G.
82-000395
Palko, B. J.
82-000216
Pant, S. C.
82-000434
Papst, M.
82-000465
Parrish, P. R.
82-000425
Parrish, R. H.
82-000294
Partridge, B. L.
82-000194
Pascal, M.
82-000067
Patra, A. K.
82-000136
Pattee, E.
82-000295
82-000319
82-000473
Pawaputanon, K.
82-000390
Paxton, R.
82-000140
Payan, P.
82-000094
Pearson, R. E.
82-000264
Peck, T. H.
82-000405
Peden, A. E.
82-000321
82-000322
Pelaez, J.
82-000499
Penaz, M.
82-000010
Pequeno R., G.
82-000323
Perdomo, C.
82-000362
Peringer, P.
82-000118
Perkins, M. A.
82-000414
Perlmutter, A.
82-000142
Perrin, J. F.
82-000319
Perrotta, R.
82-000495
Persat, H.
82-000295
82-000319
Petenusci, S. O.
82-000100
Petukhov, S. A.
82-000435
Pharo, C. H.
82-000040
Phillips, R. R.
82-000195
Pic, P.
82-000094
Picquelle, S. J.
82-000231
Pietsch, T. W.
82-000351
Pinchuk, V. I.
82-000352
Poddubnyy, A. G.
82-000279
Poe, P. H.
82-000228

## AUTHOR INDEX

Pollard, J. F.
  82-000455
Poluhowich, J. J.
  82-000098
Portsev, P. I.
  82-000280
Potter, I. C.
  82-000062
  82-000087
  82-000286
Potts, G. W.
  82-000281
Pozo, E.
  82-000296
Prete, P. J.
  82-000411
Prihoda, J.
  82-000010
Prokes, M.
  82-000297
Prosser, C. L.
  82-000192
Protopopov, N. K.
  82-000298
Putnam, M. E.
  82-000426
Quiros, R.
  82-000490
Raa, J.
  82-000011
Rab, P.
  82-000168
  82-000169
Rafn, S.
  82-000071
Randall, H. A.
  82-000353
Randall, J. E.
  82-000353
Randall, R. G.
  82-000229
Randolph, J.
  82-000451
Rao, D. M.
  82-000441
Rappaport, U.
  82-000036
Reader, N. A.
  82-000256
Reddanna, P.
  82-000431
Reed, J. K.
  82-000257
Regier, H. A.
  82-000444
Regis, J.
  82-000473
Reice, S. R.
  82-000042
Reichenbach-Klinke, H.-H.
  82-000324
Reid, G. M.
  82-000354
Reiling, S. D.
  82-000457
Repko, F. F.
  82-000400
Reshetnikov, Yu. S.
  82-000341
  82-000468
Reynolds, R. P.
  82-000310
Reynolds, W. W.
  82-000196
Rhoderick, J. C.
  82-000436
Ribbink, A. J.
  82-000260
Rice, G. K.
  82-000405
Richards, W. J.
  82-000216
Richardson, L. B.
  82-000436
Richardson, S. L.
  82-000355
Rickards, W. L.
  82-000014
  82-000139
Rimmer, D. M.
  82-000197
Rinne, J. N.
  82-000501
Robertson, D. A.
  82-000052
Robertson, D. R.
  82-000198
Roche, D. P.
  82-000377
Rodgers, D. W.
  82-000412
Romanenko, V. D.
  82-000141
Rose, S. T.
  82-000266
Rosen, M. H.
  82-000142
Ross, J. L.
  82-000456
Ross, L. G.
  82-000262
Rounick, J. S.
  82-000487
Roux, A. L.
  82-000319
Rudometkina, G. P.
  82-000072
Ruiz, R. A.
  82-000362
Rumsey, G. L.
  82-000029
Ryan, P. A.
  82-000325
Ryan, P. M.
  82-000413
Saarikoski, J.
  82-000437

# AUTHOR INDEX

Sadler, K.
82-000438
Saetersdal, T. S.
82-000061
Saito, K.
82-000419
Saito, T.
82-000143
Sakai, D. K.
82-000144
Sale, P. F.
82-000230
Salikzyanov, R. F.
82-000113
Saloman, C. H.
82-000278
Samarakoon, J. I.
82-000258
Sanchez-Medina, F.
82-000131
Sanchez, R. P.
82-000242
82-000243
Sandnes, K.
82-000145
Sanh, T. D.
82-000265
Santacana, J. A.
82-000362
Sasaki, K.
82-000439
Sasaki, S.
82-000326
Saunders, R. L.
82-000110
Savvaitova, K. A.
82-000341
Sawaya, P.
82-000100
Sayfullin, R. R.
82-000146
Sazonov, Yu. I.
82-000356
Schene, T.
82-000309
Schenkel-Brunner, H.
82-000115
Schlieker, V.
82-000249
Schweigert, J. F.
82-000073
Scott, D. P.
82-000449
Scott, G. I.
82-000253
Seki, H.
82-000474
Sekitani, T.
82-000200
Senn, D. G.
82-000074
Serebryakova, Ye. V.
82-000171
Sesso, A.
82-000049
Seth, R. N.
82-000022
Seymour, E. A.
82-000021
Shaboneyev, I. Ye.
82-000357
Shang, Y. C.
82-000004
Shaposhnikova, G. Kh.
82-000341
Shaw, R. F.
82-000304
Sheldon, J. M.
82-000198
Shell, E. W.
82-000013
Shimazaki, K.
82-000326
Shireman, J. V.
82-000001
Shoubridge, E. A.
82-000147
Sideleva, V. G.
82-000075
Sidell, B. D.
82-000150
Sieswerda, P. L.
82-000026
Sill, B. L.
82-000070
Simpson, C. F.
82-000420
Simpson, K.
82-000476
Simpson, K. L.
82-000156
Singh, S. P.
82-000022
Sirotek, D.
82-000056
Sissenwine, M. P.
82-000445
Skow, L. C.
82-000148
Slaughter, D.
82-000106
Sloane-Richey, J.
82-000414
Small, D. P.
82-000003
Smith, D.
82-000477
Smith, D. C.
82-000003
Smith, N. K. R.
82-000440
Smith, P. E.
82-000217
Snetkov, M. A.
82-000468
Sokolov, L. I.
82-000171

## AUTHOR INDEX

- Solsona, C.
  - 82-000149
- Sorensen, E. M. B.
  - 82-000440
- Springer, V. G.
  - 82-000358
- Srivastava, K. P.
  - 82-000022
- Stanford, J. A.
  - 82-000411
- Stanley, J. G.
  - 82-000463
- Stauffer, G. D.
  - 82-000231
- Stauffer, T. M.
  - 82-000475
- Steene, R. C.
  - 82-000317
- Stein, D. L.
  - 82-000218
- Sterba, O.
  - 82-000063
- Stewart, D. J.
  - 82-000282
- Stocker, M.
  - 82-000481
- Stone, B. B.
  - 82-000150
- Stoneking, M.
  - 82-000359
- Storozhuk, N. G.
  - 82-000435
- Stroband, H. W. J.
  - 82-000151
- Struthers, G.
  - 82-000262
- Suarez, R. K.
  - 82-000152
- Sugimoto, N.
  - 82-000371
- Sugiyama, A.
  - 82-000369
  - 82-000372
- Sullivan, C. R.
  - 82-000450
- Sullivan, E.
  - 82-000454
- Sunada, J. S.
  - 82-000232
- Suzuki, K.
  - 82-000076
  - 82-000153
  - 82-000154
  - 82-000219
- Suzuki, T.
  - 82-000498
- Swarup, P. A.
  - 82-000441
- Swears, S. B.
  - 82-000195
- Szabo, T.
  - 82-000191
- Tacon, A. G. J.
  - 82-000035
- Takahashi, M.
  - 82-000199
  - 82-000200
- Takeda, M.
  - 82-000439
- Tamaoki, B.
  - 82-000153
- Tamaoki, B.-I.
  - 82-000154
- Tanaka, K.
  - 82-000299
- Tanaka, Y.
  - 82-000037
  - 82-000076
  - 82-000156
  - 82-000219
- Taniuchi, T.
  - 82-000241
- Tarifeno-Silva, E.
  - 82-000396
  - 82-000404
  - 82-000415
  - 82-000416
- Taylor, J. L.
  - 82-000457
- Taylor, L. R.
  - 82-000202
- Taylor, W. W.
  - 82-000233
- Tesch, F.-W.
  - 82-000213
- Teshima, K.
  - 82-000077
- Teskeredzic, Z.
  - 82-000259
- Thakur, N. K.
  - 82-000238
- Thomas, G. L.
  - 82-000484
- Thompson, J. M.
  - 82-000234
- Thompson, N. P.
  - 82-000420
- Thorne, R. E.
  - 82-000484
- Thorpe, J. E.
  - 82-000262
- Thorson, T. B.
  - 82-000386
- Tidemann, E.
  - 82-000011
- Tocko, M. N.
  - 82-000233
- Todd, G. T.
  - 82-000201
- Todd, P. R.
  - 82-000027
  - 82-000263
- Tormosova, I. D.
  - 82-000235
- Torrissen, O.
  - 82-000011
- Tc[illegible], J. F.
  - 82-000158

# AUTHOR INDEX

Townsend, D. W.
82-000304
Toyoda, J.
82-000143
Tracey, D. M.
82-000417
Trent, L.
82-000099
Triantaphyllidis, C. D.
82-000170
Tricas, T. C.
82-000202
Tsai, C.-F.
82-000442
Tsepkin, Ye. A.
82-000497
Tsuchiya, A.
82-000203
Turnpenny, A. W. H.
82-000478
Uchiyama, M.
82-000439
Ueno, S.
82-000219
Uotani, I.
82-000283
Utida, T.
82-000185
van den Broek, W. L. F.
82-000417
Van Der Veen, F. H.
82-000151
Van Korlaar, F.
82-000108
Vargas, A. M.
82-000131
Vari, R. P.
82-000360
Vasil'yev, V. P.
82-000171
Veiluva, M.
82-000446
Veith, G. D.
82-000406
Verma, S. R.
82-000418
Vierke, J.
82-000361
Viluksela, M.
82-000437
Viola, S.
82-000036
Vogel, D.
82-000347
Voskoboynikova, O. S.
82-000078
Vostradovsky, J.
82-000220
Vsiansky, P.
82-000109
Vyshegorodtsev, V. A.
82-000079
Waarde, A. van
82-000155
Wagner, D. J.
82-000359
Wahle, R. J.
82-000264
82-000486
Waiwood, K. G.
82-000124
Waldrop, J.
82-000016
Waldrop, J. E.
82-000496
Wallace, J.
82-000286
Wankowski, J. W. J.
82-000300
Watts, W.
82-000262
Webb, P. W.
82-000204
Wehrhahn, C. F.
82-000187
Westphal, W. V.
82-000214
Wheatley, G. A.
82-000221
Whitaker, D. J.
82-000375
White, F. H.
82-000420
White, R. J.
82-000182
Whitfield, A. K.
82-000044
Whoriskey, F. G.
82-000012
Wiegand, R. C.
82-000040
Wieser, W.
82-000028
Wild, A.
82-000482
Wiley, R. W.
82-000447
Williams, E. H., Jr.
82-000391
Williams, L. B.
82-000391
Williams, T. D.
82-000054
Wingstrand, K. G.
82-000071
Winterbourn, M. J.
82-000487
Wirtz, P.
82-000333
Witzell, W. N.
82-000284
Wolters, W. R.
82-000172
Woods, L. C. III
82-000014
Woodward, S.
82-000003

## AUTHOR INDEX

Wooley, C. M.
82-000209
Wydoski, R. S.
82-000469
Yahnke, J. W.
82-000491
Yamada, J.
82-000299
Yamada, S.
82-000037
82-000156
Yamaguchi, K.
82-000128
Yamamoto, S.
82-000326
Yamamoto, Y.
82-000205
Yamashita, I. S.
82-000232
Yamazoe, Y.
82-000173
Yasuno, M.
82-000419
Yatomi, H.
82-000185
Ydenberg, R. C.
82-000269
Yoneda, M.
82-000369
82-000372
Yoshimizu, M.
82-000368
Yoshioka, T.
82-000080
Yoshiyama, R. M.
82-000206
Yoshizaki, K.
82-000081
Young, C.
82-000327
Youson, J. H.
82-000091
Yu, D. P.
82-000396
82-000404
82-000415
82-000416
Zamora, S.
82-000131
Zhukinskiy, V. N.
82-000157
Zhuravel', V. N.
82-000102
Zikic, R.
82-000057
Zimmerman, E. G.
82-000177
Zinov'yev, Ye. A.
82-000341
Zolotnitskiy, A. P.
82-000005
Zuyev, G. V.
82-000236
Zwerner, D. E.
82-000387

# GEOGRAPHIC INDEX

Africa
82-000333
Alabama: Clay Cty.: Barbaree Ck.
82-000215
Alaska
82-000328
Alaska: Bristol Bay: Kvichak River
82-000228
Arabian Sea
82-000223
Argentina
82-000242
82-000243
82-000495
Argentina: Salto Grande Reservoir
82-000490
Arizona: Yavapai Cty.
82-000327
Atlantic Ocean
82-000303
82-000397
Atlantic Ocean, North
82-000212
82-000259
82-000261
82-000304
82-000458
Atlantic Ocean, Tropical
82-000072
Australia
82-000307
Australia: Great Australian Bight
82-000316
Australia: Queensland
82-000320
Australia: Western Australia: Swan-Avon River System
82-000286
Bahama Islands
82-000178
Bermuda
82-000340
Borneo
82-000361
Brazil
82-000386
California
82-000096
82-000206
82-000244
82-000499
Canada
82-000234
Canada: British Columbia
82-000186
82-000193
82-000313
82-000318
82-000321
82-000322
82-000476
anada: British Columbia: Barkley Sound
82-000222
Canada: British Columbia: Bella Coola River Estuary
82-000493
Canada: British Columbia: Kootenay Lake
82-000040
Canada: James Bay
82-000314
Canada: New Brunswick
82-000229
Canada: Nova Scotia
82-000293
Canada: Ontario
82-000381
82-000413
Canada: Ontario: Bruce Peninsula
82-000308
Canada: Ontario: George Lake
82-000483
Canada: Ontario: Lake Opinicon
82-000336
Canada: Ontario: Laurel Creek
82-000373
Canada: Ontario: Ottawa River
82-000393
Canada: Quebec: Moisie River
82-000460
Chile
82-000323
Colorado
82-000448
Colorado: Twin Lakes
82-000452
82-000484
Columbia River
82-000159
Columbia River: John Day Reservoir
82-000285
Czechoslovakia
82-000220
England
82-000290
82-000378
82-000379
England: River Trent
82-000221
Fiji Islands
82-000325
Finland
82-000409
Florida
82-000257
82-000302
82-000315
82-000454
Florida: Apalachicola River
82-000209
Florida: Dade Cty.
82-000268
Florida: Lake Baldwin
82-000001
France
82-000295
82-000370

# GEOGRAPHIC INDEX

France: Rhone River
  82-000319
Gabon
  82-000360
Great Lakes
  82-000406
Gulf of Mexico
  82-000301
  82-000310
  82-000315
Hawaii
  82-000202
  82-000434
Indian Ocean
  82-000210
  82-000273
  82-000280
  82-000281
  82-000305
  82-000311
Iran
  82-000339
Italy
  82-000002
Italy: River Po
  82-000395
Japan
  82-000023
  82-000207
  82-000255
  82-000474
Japan: Lake Kuttara
  82-000498
Japan: Mt. Tsukuba
  82-000419
Japan: River Yura
  82-000251
Lake Michigan
  82-000282
Louisiana: Vermilion Bay
  82-000455
Maine
  82-000003
  82-000457
Maine: Gulf of Maine
  82-000304
Malaysia
  82-000363
Mexico: Chiapas
  82-000347
Michigan
  82-000182
Mozambique
  82-000305
Nebraska: Norden Reservoir
  82-000491
Netherlands
  82-000400
New York: Hudson River Estuary
  82-000405
New Zealand
  82-000246
  82-000263

...CONTINUED...

New Zealand
  82-000307
  82-000487
North Carolina
  82-000456
North Carolina: Lake Norman
  82-000377
North Carolina: Stokes Cty.: Belews L
  82-000399
Norway: Lake Arungen
  82-000270
Oklahoma: Broken Bow Dam
  82-000451
Oklahoma: Mayes Cty.: Grand River
  82-000309
Oklahoma: Mountain Fork River
  82-000451
Oregon
  82-000218
Pacific Ocean
  82-000214
  82-000218
  82-000226
  82-000231
  82-000232
  82-000234
  82-000242
  82-000243
  82-000244
  82-000272
  82-000276
  82-000283
  82-000284
  82-000294
  82-000300
  82-000313
  82-000316
  82-000318
  82-000321
  82-000322
  82-000326
  82-000332
  82-000346
  82-000375
  82-000495
  82-000499
Papua New Guinea
  82-000300
Peru
  82-000272
Philippines
  82-000317
Poland
  82-000289
  82-000297
Poland: Musov Reservoir
  82-000489
Puerto Rico
  82-000227
Rhode Island
  82-000397
[illegible]
  [illegible]

# GEOGRAPHIC INDEX

Scotland
82-000212
Scotland: Loch Voil
82-000262
South Carolina: Cherokee Cty.: Ninety-Nine Islands Impoundment
82-000374
South Carolina: Oconee Cty.: Howard Creek
82-000211
Tahiti
82-000343
Texas
82-000315
Tonga Islands
82-000284
United States, Southeastern
82-000467
United States, Western
82-000469
United States: New England
82-000463
USSR
82-000288
82-000298
82-000337
82-000342
82-000462
82-000497
USSR: Kuybyshev Reservoir
82-000331
Utah: White River
82-000312
Virgin Islands
82-000472
Virginia: Chincoteague Bay
82-000277
Washington: Seattle
82-000414
West Germany: Danube River
82-000324
West Indies
82-000391
West Virginia: Mineral Cty.
82-000225
West Virginia: New Creek Lake
82-000488
Yugoslavia: Lake Ohrid
82-000233

# SYSTEMATIC INDEX

- Abramis brama
  - Age/Growth
    - 82-000289
    - 82-000290
  - Amino Acids
    - 82-000157
  - Condition Factors
    - 82-000289
  - Digestive System
    - 82-000117
  - Eggs
    - 82-000157
  - Enzymes
    - 82-000117
  - Lipid Composition
    - 82-000157
  - Mortality Rates
    - 82-000289
  - Year Class Strength
    - 82-000290
- Abramis farenus
  - Heavy Metals
    - 82-000409
  - Mercury
    - 82-000409
- Acerina cernua
  - Light
    - 82-000088
  - Reproduction
    - 82-000088
  - Temperature
    - 82-000088
- Acipenser baeri
  - Culture/Propagation
    - 82-000462
  - Karyotypes
    - 82-000171
  - Stocking/Introductions
    - 82-000462
- Acipenser guldenstadti
  - Magnesium
    - 82-000133
  - Osmoregulation
    - 82-000133
- Acipenser ruthenus
  - Maturation
    - 82-000146
  - Reservoir Release Effects
    - 82-000146
- Acipenser stellatus
  - Age/Length Composition
    - 82-000245
  - Amino Acids
    - 82-000083
  - Hormones
    - 82-000103
  - Maturation
    - 82-000245
- Alburnoides bipunctatus ohridanus
  - Life History/General
    - 82-000233
  - Population Studies
    - 82-000233
- Aldrichetta forsteri
  - Age/Growth
    - 82-000286
  - Movements
    - 82-000286
- Alepisaurus
  - Meristic Studies
    - 82-000050
  - Variation Studies
    - 82-000050
- Alepisaurus ferox
  - Musculature
    - 82-000080
- Allosmerus elongatus
  - Distribution/Geographical
    - 82-000313
- Alos apseudoharengus
  - Population Studies
    - 82-000488
- Alosa aestivalis
  - Distribution/Seasonal
    - 82-000261
- Alosa pseudoharengus
  - Distribution/Seasonal
    - 82-000261
  - Forage Introductions
    - 82-000488
  - Management/Research--Ponds
    - 82-000488
  - Predator/Prey Relationships
    - 82-000282
- Ambloplites rupestris
  - Acid Precipitation
    - 82-000413
  - Age/Growth
    - 82-000413
- Anabas testudineus
  - Spawning
    - 82-000238
- Anableps anableps
  - Reproductive System
    - 82-000051
- Anableps dowi
  - Reproductive System
    - 82-000051
- Anguilla
  - Culture/Propagation
    - 82-000027
  - Distribution/Geographical
    - 82-000213
  - Distribution/Vertical
    - 82-000213
  - Induced Maturation
    - 82-000027
  - Life History/General
    - 82-000213
  - Movements
    - 82-000263
  - Spawning
    - 82-000213
- Anguilla anguilla
  - Ammonia
    - 82-000438

# SYSTEMATIC INDEX

...CONTINUED...
Anguilla anguilla
  Culture/Propagation
   82-000438
  Protein Synthesis
   82-000109
  Temperature
   82-000109
Anguilla japonica
  Bacterial Diseases
   82-000366
   82-000371
  Edwardsiella tarda
   82-000366
  Flexibacter columnaris
   82-000371
  Parasites/Diseases
   82-000366
   82-000371
Anguilla rostrata
  Blood Chemistry
   82-000098
  Lipid Composition
   82-000139
  Lipid Content
   82-000139
Anquilla anguilla
  Age/Growth
   82-000287
Apeltes quadracus
  Ecology
   82-000045
  Meristic Studies
   82-000045
Aphyosemion gardneri
  Spawning
   82-000248
Archomenidia
  Taxonomy
   82-000338
Aristichthys nobilis
  Nutrition
   82-000032
Barbus conchonius
  Carbamates
   82-000434
  Insecticides
   82-000434
  Temik
   82-000434
Barbus meridionalis
  Electrophoresis
   82-000170
  Variation Studies
   82-000170
Blennius ponticus
  Taxonomy
   82-000334
Bodianus prognathus
  New Species
   82-000346
Brachydanio nigrofasciatus
  Alcohol Dehydrogenase
   82-000101
Brachydanio rerio
  Heavy Metals
   82-000432
  Lead
   82-000432
  Predator/Prey Relationships
   82-000432
Brama japonica
  Distribution/Geographical
   82-000326
  Distribution/Seasonal
   82-000326
Brevoortia
  Nets/Netting
   82-000471
  Purse Seines
   82-000471
Brevoortia patronus
  Marking/Tagging
   82-000461
Butis butis
  Distribution/Geographical
   82-000325
Bythitidae
  Distribution/Geographical
   82-000303
Carangidae
  Culture/Propagation
   82-000185
  Orientation/Homing
   82-000185
  Predator/Prey Relationships
   82-000281
Carassius auratus
  Anoxia
   82-000147
  Enzymes
   82-000142
  Induced Ovulation
   82-000111
  Metabolic Rates
   82-000140
  Metabolism
   82-000155
  Nitrogen
   82-000155
  Osmoregulation
   82-000137
  Phosphates
   82-000439
  Reproduction
   82-000111
  Temperature
   82-000114
   82-000140
Carassius auratus gibelio
  Age/Growth
   82-000288
  Age/Length Composition
   82-000288
  Osmoregulation
   82-000097
  Scales
   82-000288

## SYSTEMATIC INDEX

- Carassius carassius
  - Culture/Propagation
    - 82-000021
  - Induced maturation
    - 82-000021
  - Light
    - 82-000021
  - Temperature
    - 82-000021
- Carcharhinus
  - Distribution/Geographical
    - 82-000301
- Carcharhinus plumbeus
  - Foods/Feeding
    - 82-000277
- Catostomus commersoni
  - Cnidospora
    - 82-000373
  - Parasites/Diseases
    - 82-000373
  - Protozoan Diseases
    - 82-000373
- Catostomus macrocheilus x C. columbianus
  - Hybridization
    - 82-000159
- Caulolatilus bermudensis
  - New Species
    - 82-000340
- Cebidichthys violaceus
  - Digestive System
    - 82-000096
  - Foods/Feeding
    - 82-000096
- Centropyge
  - Spawning
    - 82-000239
- Chaenogobius
  - Taxonomy
    - 82-000352
- Chaetodon
  - Anilocra
    - 82-000391
  - Parasites/Diseases
    - 82-000391
  - Parasitic Isopods
    - 82-000391
- Chalcalburnus chalcoides
  - Temperature
    - 82-000082
- Channa
  - Air Breathing
    - 82-000136
- Chasmodes bosquianus
  - Activity Patterns
    - 82-000195
- Cheilotrema saturnum
  - Spawning
    - 82-000247
- Chelon labrosus
  - Ergenstrema labrosi
    - 82-000378
  - Gill Parasites
    - 82-000378

...CONTINUED...

- Chelon labrosus
  - Parasites/Diseases
    - 82-000378
    - 82-000379
  - Trematodes
    - 82-000378
    - 82-000379
- Cirrhilabrus temminckii
  - Early Development
    - 82-000076
- Cirrhinus mrigala
  - Endosulfan
    - 82-000441
  - Insecticides
    - 82-000441
- Clupea harengus
  - Auditory Senses
    - 82-000175
    - 82-000176
  - Startle Response
    - 82-000175
    - 82-000176
- Clupea harengus harengus
  - Electrophoreis
    - 82-000163
  - Electrophoresis
    - 82-000163
  - Meristic Studies
    - 82-000073
  - Variation Studies
    - 82-000163
    - 82-000163
- Clupea harengus pallasi
  - Electrophoresis
    - 82-000163
  - Variation Studies
    - 82-000163
    - 82-000163
- Clupeonella delicatula
  - Salinity
    - 82-000121
  - Sperm
    - 82-000121
- Coelonotus argulus
  - Distribution/Geographical
    - 82-000325
- Comephoridae
  - Seismosensory System
    - 82-000075
- Coregonidae
  - Stocking/Introductions
    - 82-000468
- Coregonus clupeaformis
  - Exploitation Rates
    - 82-000224
  - Population Studies
    - 82-000224
  - Spawning
    - 82-000254
- Coregonus fera
  - Age/Growth
    - 82-000306
  - Biochemical Composition
    - 82-000306

R
All
been
Unfo
scatt
are n

# SYSTEMATIC INDEX

- Coregonus lavaretus
  - Salinity
    - 82-000102
- Coregonus lavaretus pidschian
  - Age/Growth
    - 82-000298
  - Scales
    - 82-000298
- Coregonus sardinella marisalbi
  - Salinity
    - 82-000102
- Coryphaena hippurus
  - Locomotion
    - 82-000204
- Coryphaenoides holotrachys
  - Fecundity
    - 82-000250
- Cottidae
  - Seismosensory System
    - 82-000075
- Cottus rhotheus
  - Predator/Prey Relationships
    - 82-000266
- Ctenopharyngodon
  - Anatomy
    - 82-000344
  - Taxonomy
    - 82-000344
- Ctenopharyngodon idella
  - Aquatic Plant Control
    - 82-000001
  - Digestive System
    - 82-000151
  - Foods/Feeding
    - 82-000265
- Cyprinidae
  - Reproductive System
    - 82-000063
- Cyprinodon
  - Electrophoresis
    - 82-000345
  - Taxonomy
    - 82-000345
  - Variation Studies
    - 82-000345
- Cyprinodon variegatus
  - Industrial Wastes
    - 82-000425
- Cyprinus carpio
  - Amino Acids
    - 82-000037
  - Blood Chemistry
    - 82-000085
  - Culture/Propagation
    - 82-000036
  - Feeding Experiments
    - 82-000036
    - 82-000037
  - Feeds
    - 82-000036
  - Fin Rays
    - 82-000067

...CONTINUED...

- Cyprinus carpio
  - Nervous System
    - 82-000122
  - Tubulin
    - 82-000122
  - Vision
    - 82-000143
- Dallia asmirabilis
  - New Species
    - 82-000337
- Dasyatis centroura
  - Spawning
    - 82-000257
- Dasyatis sabina
  - Corneal Injuries
    - 82-000389
  - Parasites/Diseases
    - 82-000389
- Dorosoma cepedianum
  - Karyotypes
    - 82-000162
- Dorosoma petenense
  - Karyotypes
    - 82-000162
- Doryichthys retzi
  - Distribution/Geographical
    - 82-000325
- Echeneis naucrates
  - Life History/General
    - 82-000210
- Eigenmannia
  - Electrolocation
    - 82-000188
- Eleotridae
  - Taxonomy
    - 82-000342
- Eleotris maltzani
  - Taxonomy
    - 82-000348
- Elops saurus
  - Vision
    - 82-000055
- Engraulis anchoita
  - Population Studies
    - 82-000243
  - Spawning
    - 82-000243
- Engraulis mordax
  - Age/Growth
    - 82-000294
  - Age/Length Composition
    - 82-000226
    - 82-000232
  - Biomass
    - 82-000231
  - Population Studies
    - 82-000226
    - 82-000231
    - 82-000232
  - Remote Sensing
    - 82-000499
  - Spawning
    - 82-000499

...CONTINUED...
- Engraulis mordax
  - Year Class Strength
    - 82-000226
- Esox lucius
  - Age/Growth
    - 82-000220
  - Foods/Feeding
    - 82-000220
  - Heavy Metals
    - 82-000409
  - Life History/General
    - 82-000220
  - Mercury
    - 82-000409
- Etelis
  - Taxonomy
    - 82-000332
- Etelis radiosus
  - New Species
    - 82-000332
- Etheostoma coosae
  - Life History/General
    - 82-000215
- Etroplus maculatus
  - Spawning
    - 82-000258
- Etroplus suratensis
  - Spawning
    - 82-000258
- Eucinostomus melanopterus
  - Distribution/Geographical
    - 82-000315
- Eupomacentrus
  - Communication
    - 82-000174
  - Sound Production
    - 82-000174
- Eupomacentrus planifrons
  - Territorial Behavior
    - 82-000198
- Exocoetidae
  - Abundance
    - 82-000236
  - Distribution/Geographical
    - 82-000311
- Fundulus
  - Karyotypes
    - 82-000164
  - Sex Determination
    - 82-000164
- Fundulus heteroclitus
  - Metabolic Rates
    - 82-000140
  - Temperature
    - 82-000140
- Gadus morhua
  - Antifreeze Production
    - 82-000106
  - Ascorbic Acid
    - 82-000145
  - Bacterial Diseases
    - 82-000367
  - Blood Chemistry
    - 82-000112

...CONTINUED...
- Gadus morhua
  - Fin Rot
    - 82-000367
  - Locomotion
    - 82-000179
  - Parasites/Diseases
    - 82-000367
  - Reproduction
    - 82-000145
- Galeocerdo cuvier
  - Activity Patterns
    - 82-000202
- Gambusia affinis
  - Light
    - 82-000134
  - Reproduction
    - 82-000134
- Geotria australis
  - Biochemical Composition
    - 82-000087
  - Dentition
    - 82-000062
  - Metamorphosis
    - 82-000062
    - 82-000087
  - Mouth Parts
    - 82-000062
- Gilchristella aestuarius
  - Body Form
    - 82-000044
- Gillichthys mirabilis
  - Osmoregulation
    - 82-000125
    - 82-000126
  - Rubidium
    - 82-000125
- Girella nigricans
  - Cleaning Behavior
    - 82-000180
- Gnathonemus petersii
  - Electrical Communication
    - 82-000191
- Gobio gobio
  - Mersitic Studies
    - 82-000058
- Gonostoma atlanticum
  - Early Development
    - 82-000072
- Haplochromis livingstoni
  - Death Feigning
    - 82-000190
- Hermosilla azurea
  - Cleaning Behavior
    - 82-000180
- Holanthias martinicensis
  - Hermaphroditism
    - 82-000092
- Hoplostethus atlanticus
  - Heavy Metals
    - 82-000417
  - Mercury
    - 82-000417
- Hucho hucho
  - Culture/Propagation
    - 82-000010

...CONTINUED...
Hucho hucho
  Early Development
   82-000010
  Embryology
   82-000010
Huso huso x Acipenser stellatus
  Hybridization
   82-000165
  Morphology
   82-000165
Hypleurochilus aequipinnis
  Taxonomy
   82-000333
Hypodytes rubripinnis
  Life History/General
   82-000219
  Spawning
   82-000219
Hypophthalmichthys
  Anatomy
   82-000344
  Taxonomy
   82-000344
Hypophthalmichthys molitrix
  Culture/Propagation
   82-000415
  Gills
   82-000056
  Nutrition
   82-000032
  Respiratory System
   82-000056
  Sewage Effluents
   82-000415
Hypostomus regani
  Air Breathing
   82-000100
  Blood Chemistry
   82-000100
Ichthyococcus
  Distribution/Geographical
   82-000350
  Taxonomy
   82-000350
Ictalurus nebulosus
  Nutrient Cycling
   82-000041
  Phosphorus
   82-000041
Ictalurus punctatus
  Age/Growth
   82-000292
  Arsenic
   82-000440
  Culture/Propagation
   82-000015
   82-000016
   82-000496
  Heavy Metals
   82-000440
  Marketing
   82-000496
  Piscicides
   82-000104

...CONTINUED...
Ictalurus punctatus
  Polyculture
   82-000015
  Skeletal System
   82-000104
  Toxaphene
   82-000104
  Triploid Fish
   82-000172
  Vitamins
   82-000104
Ictiobus cyprinella
  Embryology
   82-000065
Jenynsia lineata
  Reproductive System
   82-000051
Katsuwonus pelamis
  Age/Growth
   82-000300
Labeo werneri
  Taxonomy
   82-000354
Labroides dimidiatus
  Early Development
   82-000076
Lagocephalus sceleratus
  Distribution/Geographical
   82-000307
Lampanycutus macropterus
  Distribution/Geographical
   82-000335
  Identification
   82-000335
  Taxonomy
   82-000335
Latridopsis ciliaris
  Spawning Migration
   82-000246
Leiostomus xanthurus
  Bromate
   82-000436
  Temperature
   82-000107
  Thermal Shock
   82-000107
Lepomis
  Identification
   82-000336
Lepomis cyanellus
  Nervous System
   82-000192
  Temperature
   82-000192
Lepomis gibbosus
  Actinocleidus oculatus
   82-000381
  Actinocleidus recurvatus
   82-000381
  Parasites/Diseases
   82-000381
  Trematodes
   82-000381

## SYSTEMATIC INDEX

Lepomis macrochirus
Foods/Feeding
82-000200
82-000274
Hydrazine
82-000426
pH
82-000411
Pollution Avoidance
82-000411
Population Studies
82-000225
Predator/Prey Relationships
82-000274
Leuciscus cephalus
Age/Growth
82-000297
Limanda yokohamae
Reproduction
82-000138
Liparididae
Life History/General
82-000218
Lophogobius cyprinoides
Foods/Feeding
82-000268
Luciocephalus pulcher
Foods/Feeding
82-000060
Mouth Parts
82-000060
Lutjanus analis
Age/Growth
82-000296
Macropodus
Nervous System
82-000093
Olfaction
82-000093
Macrouridae
Life History/General
82-000218
Mallotus villosus
Abundance/Factors of
82-000329
Year Class Strength
82-000329
Marcusenius isidori
Coloration
82-000081
Marcusenius longianalis
Coloration
82-000081
Medialuna californiensis
Distribution/Geographical
82-000318
Melanogrammus aeglefinus
Year Class Strength
82-000235
Menidia menidia
Spawning
82-000252
...CONTINUED...
82-000253
Merluccius bilinearis
Age/Growth
82-000293
Distribution/Geographical
82-000293
Merluccius hubbsi
Population Studies
82-000242
82-000480
Spawning
82-000242
Merluccius productus
Kudoa
82-000375
Parasites/Diseases
82-000375
Protozoan Diseases
82-000375
Microgadus tomcod
Polychlorinated Biphenyls
82-000405
Micrognathus pygmaeus
New Species
82-000343
Micropterus
Competition
82-000267
Foods/Feeding
82-000267
Micropterus salmoides
Population Studies
82-000225
Morone saxatilis
Bromate
82-000436
Cannibalism
82-000013
Culture/Propagation
82-000013
Life History/General
82-000209
Population Studies
82-000209
Temperature
82-000150
Morone saxatilis x M. chrysops
Culture/Propagation
82-000014
Tank Culture
82-000014
Mugil cephalus
Age/Growth
82-000286
Movements
82-000286
Mugil liza
Spawning
82-000237
Mustelus griseus
Embryology
82-000077
Myctophidae
Population Studies
82-000223

# SYSTEMATIC INDEX

Mystus seenghala
  Culture/Propagation
    82-000022
  Fingerling Production
    82-000022
Nannocharax maculicauda
  New Species
    82-000360
Naucrates ductor
  Distribution/Geographical
    82-000321
Neoceratodus forsteri
  Culture/Propagation
    82-000018
  Digestive System
    82-000071
Neophrynichthys marmoratus
  Distribution/Geographical
    82-000323
Nezumia bairdii
  Diclidophora nezumiae
    82-000387
  Parasites/Diseases
    82-000387
  Trematodes
    82-000387
Notemigonus crysoleucas
  Culture/Propagation
    82-000416
  Heavy Metals
    82-000416
  Sewage Effluents
    82-000404
    82-000416
Notopterus notopterus
  Heavy Metals
    82-000418
Notropis cornutus
  Schooling Behavior
    82-000161
  Variation Studies
    82-000161
Notropis lutrensis
  Sewage Effluents
    82-000404
Notropis venustus
  Temperature
    82-000177
  Temperature Selection
    82-000177
Odontogadu meriangus euxinus
  Metabolic Rates
    82-000113
Omobranchini
  Taxonomy
    82-000358
Omobranchus robertsi
  New Species
    82-000358
Omox lupus
  New Species
    82-000358
Oncorhynchus gorbuscha
  Salinity
    82-000102
  Spawning
    82-000240
Oncorhynchus keta
  Heavy Metals
    82-000435
  Mercury
    82-000435
Oncorhynchus kisutch
  Culture/Propagation
    82-000007
    82-000008
    82-000009
  Foods/Feeding
    82-000269
  Heavy Metals
    82-000435
  Induced Maturation
    82-000007
    82-000008
    82-000009
  Mercury
    82-000435
  Territorial Behavior
    82-000269
Oncorhynchus masou
  Spawning
    82-000251
Oncorhynchus nerka
  Fertilization/Soil and Water
    82-000476
  Herbicides
    82-000429
  Nursery Lakes
    82-000476
  Parasites/Diseases
    82-000390
  Parasitic Copepods
    82-000390
  Population Studies
    82-000228
    82-000498
  Salmincola californiensis
    82-000390
  2,4-D
    82-000429
Oncorhynchus rhodurus
  Reproduction
    82-000154
  Steroids
    82-000154
Oncorhynchus tshawytscha
  Amino Acids
    82-000006
  Culture/Propagation
    82-000006
  Fertilization/Soil and Water
    82-000006
  Movements
    82-000264
  Nutrition
    82-000006

## SYSTEMATIC INDEX

...CONTINUED...
Oncorhynchus tshawytscha
Restoration of Anadromous Runs
82-000486
Ophidiidae
Distribution/Geographical
82-000303
Opsanus tau
Activity Patterns
82-000195
Enzymes
82-000132
Swimbladder
82-000132
Orthodon microlepidotus
Hypoxia
82-000089
Respiration
82-000089
Oryzias latipes
Cadmium
82-000430
Embryology
82-000135
Heavy Metals
82-000430
Phosphates
82-000439
Osmerus mordax
Predator/Prey Relationships
82-000282
Pagrus major
Culture/Propagation
82-000023
Paraliparis rosaceus
Distribution/Geographical
82-000322
Parophrys vetulus
Glugea stephani
82-000376
Parasites/Diseases
82-000376
Protozoan Diseases
82-000376
Parosphromenus filamentosus
New Species
82-000361
Peociliopsis occidentalis occidentalis
Floods
82-000327
Status
82-000327
Perca flavescens
Acid Precipitation
82-000413
Age/Growth
82-000413
Gill Parasites
82-000382
Parasites/Diseases
82-000382
82-000383
Trematodes
82-000382

...CONTINUED...
82-000383
Urocleidus adspectus
82-000382
82-000383
Perca fluviatilis
Bacterial Diseases
82-000370
Foods/Feeding
82-000270
Parasites/Diseases
82-000370
Reproductive System
82-000059
Petromyzon marinus
Fish Control/Removal
82-000459
Metamorphosis
82-000091
Sterilization
82-000459
Petrotilapia
Distribution/Vertical
82-000260
Hydrostatic Pressure
82-000260
Pimelodus maculatus
Liver
82-000049
Pimephales promelas
Cnidospora
82-000373
Culture/Propagation
82-000416
Heavy Metals
82-000416
Parasites/Diseases
82-000373
Protozoan Diseases
82-000373
Sewage Effluents
82-000404
82-000416
Platichthys flesus
Lipid Metabolism
82-000105
Temperature
82-000105
Platytroctidae
Taxonomy
82-000356
Plecoglossus altivelis
Bacterial Diseases
82-000369
82-000372
Hormones
82-000153
Life History/General
82-000207
Parasites/Diseases
82-000369
82-000372
Reproduction
82-000153

# SYSTEMATIC INDEX

...CONTINUED...
- Plecoglossus altivelis
  - Streptococcus
    - 82-000369
    - 82-000372
  - Taxonomy
    - 82-000207
  - Vibrio anguillarum
    - 82-000369
- Pleuronectes platessa
  - Amino Acids
    - 82-000130
  - Metabolism
    - 82-000130
- Pleuronectes platessa x Platichthys flesus
  - Hybridization
    - 82-000166
  - Maturation
    - 82-000166
  - Triploid Fish
    - 82-000166
- Poecilia reticulata
  - Air Breathing
    - 82-000116
  - Copper
    - 82-000442
  - Heavy Metals
    - 82-000442
  - Hypoxia
    - 82-000116
  - Phenols
    - 82-000437
  - Spawning
    - 82-000249
  - Temperature
    - 82-000249
- Poeciliopsis knilickai
  - New Species
    - 82-000347
- Pomacentrus partitus
  - Anilocra
    - 82-000391
  - Parasites/Diseases
    - 82-000391
  - Parasitic Isopods
    - 82-000391
- Pomatomus saltatrix
  - Blood Chemistry
    - 82-000123
  - Reproduction
    - 82-000123
- Pomatoschistus norvegicus
  - Life History/General
    - 82-000212
- Porichthys notatus
  - Age/Growth
    - 82-000208
  - Foods/Feeding
    - 82-000208
- Potamotrygon circularis
  - Paraheteronchocotyle amazonensis
    - 82-000386
  - Parasites/Diseases
    - 82-000386

...CONTINUED...
- Potamotrygon circularis
  - Potamotrygonocotyle tsalickisi
    - 82-000386
  - Trematodes
    - 82-000386
- Promicrops lanceolatus
  - Foods/Feeding
    - 82-000284
  - Predator/Prey Relationships
    - 82-000284
- Protopterus aethiopicus
  - Musculature
    - 82-000046
- Pseudojuloides
  - Taxonomy
    - 82-000353
- Pseudophoxinus persidis
  - New Species
    - 82-000339
- Psychrolutes phrictus
  - Distribution/Geographical
    - 82-000322
- Pterophyllum eimekei
  - Locomotion
    - 82-000179
- Ptychocheilus lucius
  - Culture/Propagation
    - 82-000017
  - Raceway Culture
    - 82-000017
- Pylodictis olivaris
  - Age/Growth
    - 82-000292
- Quintana atrizona
  - Maturation
    - 82-000084
  - Meristic Studies
    - 82-000084
  - Morphology
    - 82-000084
- Rhincodon typus
  - Distribution/Geographical
    - 82-000310
- Rhizoprionodon
  - Distribution/Geographical
    - 82-000301
- Rhodoniichthys
  - Taxonomy
    - 82-000352
- Rutilus rutilus
  - Foods/Feeding
    - 82-000270
  - Thermal Pollution
    - 82-000407
- Rutilus rutilus hecheli
  - Amino Acids
    - 82-000157
  - Eggs
    - 82-000157
  - Lipid Composition
    - 82-000157
- Salmo clarki
  - Competition
    - 82-000193

## SYSTEMATIC INDEX

Salmo gairdneri
  Acanthocephala
    82-000388
  Acanthocephalus lucidus
    82-000388
  Alimentary Tract/Bacterial Flora
    82-000118
  Amino Acids
    82-000156
  Ammonia
    82-000421
  Anesthetics
    82-000422
  Blood Chemistry
    82-000085
  Competition
    82-000193
  Copper
    82-000205
    82-000423
  Culture/Propagation
    82-000011
    82-000029
    82-000465
  Currents
    82-000187
  Diets
    82-000029
  Digestive System
    82-000048
  Enzymes
    82-000131
  Heavy Metals
    82-000205
    82-000412
    82-000423
  Hexachlorobenzene
    82-000408
  Hormones
    82-000119
  Life History/General
    82-000211
  Lipid Content
    82-000119
  Lipid Metabolism
    82-000090
  Mercury
    82-000412
  Nitrogen Mustard
    82-000424
  Nutrition
    82-000029
    82-000030
  Osmoregulation
    82-000094
  Parasites/Diseases
    82-000388
  Pigmenters
    82-000011
  Rheotropism
    82-000186
    82-000187
...CONTINUED...
Salmo gairdneri
  Starvation
    82-000131
  Thiourea
    82-000095
  Vitamins
    82-000030
  2-Phenoxyethanol
    82-000422
Salmo salar
  Age/Growth
    82-000160
  Culture/Propagation
    82-000031
  Diets
    82-000031
  Feeding Experiments
    82-000031
  Habitat Selection
    82-000197
  Maturation
    82-000160
  Movements
    82-000262
  Parr-Smolt Transformation
    82-000110
  Population Studies
    82-000229
  Production
    82-000229
Salmo trutta
  Competition
    82-000182
  Enzymes
    82-000152
  Heavy Metals
    82-000410
  Liver
    82-000152
  Spawning
    82-000256
  Swimming Performance
    82-000158
  Zinc
    82-000410
Salmonidae
  Immune Response
    82-000115
  Predator/Prey Relationships
    82-000282
Salmonoidei
  Taxonomy
    82-000341
Salvelinus fontinalis
  Age/Growth
    82-000167
  Artificial Spawning Beds
    82-000483
  Biological Tags
    82-000460
  Chlorinated Compounds
    82-000428
  Chlorinated Hydrocarbons
    82-000428

# SYSTEMATIC INDEX

...CONTINUED...

- Salvelinus fontinalis
  - Competition
    - 82-000182
  - Culture/Propagation
    - 82-000012
  - Electrophoresis
    - 82-000359
  - Insecticides
    - 82-000428
  - Mirex
    - 82-000428
  - Ocean Ranching
    - 82-000012
  - Parasites/Diseases
    - 82-000460
  - Taxonomy
    - 82-000359
  - Variation Studies
    - 82-000359
- Salvelinus leucomaenis
  - Spawning
    - 82-000251
- Salvelinus namaycush
  - Artificial Spawning Beds
    - 82-000483
  - Egg Collection
    - 82-000475
  - Nets/Netting
    - 82-000475
- Sardina pilchardus
  - Meristic Studies
    - 82-000057
  - Spawning
    - 82-000259
- Schistura
  - Taxonomy
    - 82-000349
- Sciaenops ocellata
  - Abundance/Factors of
    - 82-000330
  - Early Development
    - 82-000054
  - Embryology
    - 82-000054
  - Heavy Metals
    - 82-000420
  - Salinity
    - 82-000330
  - Temperature
    - 82-000330
- Scomber japonicus
  - Age/Growth
    - 82-000294
- Scomber scombrus
  - Halvorsenius exilis
    - 82-000385
  - Parasites/Diseases
    - 82-000385
  - Trematodes
    - 82-000385
- Scomberomorus cavalla
  - Blood Chemistry
    - 82-000123

...CONTINUED...

- Scomberomorus cavalla
  - Foods/Feeding
    - 82-000278
  - Identification/Larvae
    - 82-000355
  - Reproduction
    - 82-000123
- Scomberomorus maculatus
  - Blood Chemistry
    - 82-000148
  - Electrophoresis
    - 82-000148
  - Foods/Feeding
    - 82-000278
  - Identification/Larvae
    - 82-000355
- Scombridae
  - Culture/Propagation
    - 82-000185
  - Foods/Feeding
    - 82-000283
  - Orientation/Homing
    - 82-000185
- Scophthalmus maeoticus
  - Culture/Propagation
    - 82-000005
  - Endocrinology
    - 82-000005
  - Induced Maturation
    - 82-000005
- Scophthalmus maximus
  - Bacterial Diseases
    - 82-000364
  - Parasites/Diseases
    - 82-000364
  - Vibriosis
    - 82-000364
- Searsiidae
  - Taxonomy
    - 82-000356
- Sebastes
  - Musculature
    - 82-000064
  - Sound Production
    - 82-000064
- Sebastes dallii
  - Early Development
    - 82-000068
- Sebastes serranoides
  - Life History/General
    - 82-000214
- Seriola dorsalis
  - Distribution/Geographical
    - 82-000318
- Seriolella punctata
  - Early Development
    - 82-000052
  - Embryology
    - 82-000052
- Seriphus politus
  - Fecundity
    - 82-000244
- Silurus glanis
  - Karyotypes
    - 82-000163

# SYSTEMATIC INDEX

Sphoeroides pachygaster
  Distribution/Geographical
    82-000307
Sphyrna
  Distribution/Geographical
    82-000301
Spicara smaris
  Metabolic Rates
    82-000113
Squalus japonicus
  Reproduction
    82-000241
Sternopygus
  Electrolocation
    82-000188
Stizostedion vitreum vitreum
  Age/Growth
    82-000285
  Culture/Propagation
    82-000019
    82-000020
  Fingerling Culture
    82-000019
    82-000020
  Foods/Feeding
    82-000020
  Olfaction
    82-000047
  Pond Culture
    82-000019
    82-000020
Taractes asper
  Distribution/Geographical
    82-000322
Tetrabrachium
  Skeletal System
    82-000351
  Taxonomy
    82-000351
Tetragonurus
  Foods/Feeding
    82-000271
  Predator/Prey Relationships
    82-000271
Tetraodontidae
  Distribution/Geographical
    82-000307
Theragra chalcogramma
  Egg Drift
    82-000255
  Management/Research--Marine
    82-000234
  Meristic Studies
    82-000079
  Population Studies
    82-000234
  Sexual Dimorphism
    82-000079
Thunnus albacares
  Age/Growth
    82-000300
  Foods/Feeding
    82-000273
Thunnus obesus
  Foods/Feeding
    82-000273
Thymallus thymallus
  Age/Growth
    82-000295
Tilapia mariae
  Distribution/Geographical
    82-000302
Tilapia mossambica
  pH
    82-000431
Tilapia nilotica
  Age/Growth
    82-000299
  Light
    82-000299
Tinca tinca
  Blood Chemistry
    82-000085
Torpedo marmorata
  Electric Organs
    82-000149
Toxicology
  Ammonia
    82-000421
Trachurus
  Taxonomy
    82-000357
Trachurus symmetricus
  Age/Growth
    82-000294
Trachurus symmetricus murphyi
  Foods/Feeding
    82-000272
Trematomus
  Skeletal System
    82-000078
Trichiurus lepturus
  Foods/Feeding
    82-000280
Uegitglanis zammaranoi
  Aggressive Behavior
    82-000181
Umbra krameri
  Karyotypes
    82-000169
Xenolepidichthys dalgleishi
  Distribution/Geographical
    82-000304
Xiphias gladius
  Life History/General
    82-000216

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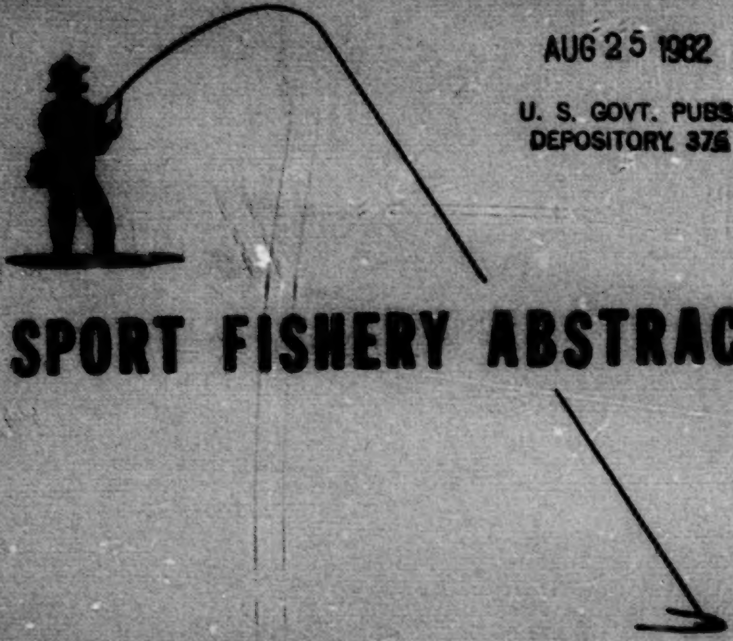

# SPORT FISHERY ABSTRACTS

Vol. 27, No. 2, 1982

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# SPORT FISHERY ABSTRACTS

*Roger Schoumacher, Editor*
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# SPORT FISHERY ABSTRACTS

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Volume 27 Number 2 1982

## CONTENTS

CULTURE AND PROPAGATION

General Fish Culture.......... 1
Trout and Salmon Culture .......... 2
Warmwater Culture.......... 4
Mariculture.......... 7
Feeds, Feeding and Nutrition.......... 8
Transporting Fish.......... 12
Miscellaneous Culture Techniques and Equipment.......... 13

LIMNOLOGY AND OCEANOGRAPHY

General.......... 14
Chemical.......... 14
Benthos.......... 14
Plankton.......... 15
Primary Production.......... 15

MORPHOLOGY, PHYSIOLOGY, GENETICS AND BEHAVIOR

Morphology.......... 16
Physiology.......... 21
Genetics, Variation Studies, Hybridization.......... 38
Behavior.......... 42

NATURAL HISTORY

Life Histories - General Works.......... 49
Population Studies - Production, Standing Crop, Recruitment .......... 54
Spawning Habits and Movements, Sex Ratios, Fecundity, etc.......... 58
Movements, Seasonal and Depth Distribution, etc. .......... 61
Foods and Feeding.......... 63
Age and Growth.......... 74
Geographical Distribution, Fish surveys, etc.......... 77
Abundance, Factors of; Survival and Mortality.......... 81
Identification, Keys, Classification.......... 83

PARASITES AND DISEASES

General.......... 87
Bacterial .......... 89
Fungal .......... 90
Protozoan.......... 90
Viral.......... 91
Other.......... 91

POLLUTION AND TOXICOLOGY

Pollution.......... 95
Fish Kills.......... 99
Toxicology; Bioassays.......... 99

## RESEARCH AND MANAGEMENT

General.... 105
Habitat Alterations.... 107
Harvest, Creel Census, etc. .... 109
Fish Control and Removal.... 109
Marking and Tagging.... 110
Stocking and Introductions.... 111
Fishing Gear and Techniques.... 113
Fertilization of Water and Soil.... 114
Fishways, Fish Passage through Dams, etc. .... 115
Mathematics, Statistical Methods and Modeling.... 116
Lake Management and Research.... 117
River and Stream Management and Research.... 120
Farm Pond and Small Impoundment Management and Research.... 121
Large Impoundment Management and Research.... 122
Estuary Management and Research.... 123
Marine Management and Research.... 124
Miscellaneous Techniques and Equipment.... 125
Reviews, Bibliographies, etc. .... 125

AUTHOR INDEX (Salmon).... 127
GEOGRAPHIC INDEX (Yellow).... 151
SYSTEMATIC INDEX (Blue).... 157

## GENERAL FISH CULTURE

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[Sch. For. Wildl. Manage., La. State Univ., Baton Rouge 70803]

82-000505 Carr, B. A. THE CULTURE AND BEHAVIOR OF SELECTED ESTUARINE FISH AND SHELLFISH IN AQUARIA RECEIVING EFFLUENT WATER FROM A POWER PLANT. *Ph.D. dissertation, Tex. A&M Univ.* 245p. 1981. From Diss. Abstr. Int. B Sci. Eng. 42(9):3512. Mar. 1982. SFA 27(2)

82-000506 Chakroff,M. S. AQUACULTURE EXTENSION SERVICES CASE STUDIES. *FAO Fish. Circ.* No. 740. v + 27p. Nov. 1981. SFA 27(2)
[FAO, Rome, Italy]

82-000507 Freeze, M. and S. Henderson. THE AQUACULTURE INDUSTRY OF ARKANSAS IN 1979. *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:115-126. 1980[1981]. SFA 27(2)
[Ark. Game Fish Comm., Little Rock 72205]

82-000508 Hynes, J. D.; E. H. Brown, Jr.; J. H. Helle; N. Ryman and D. A. Webster. GUIDELINES FOR THE CULTURE OF FISH STOCKS FOR RESOURCE MANAGEMENT. *Can. J. Fish. Aquatic Sci.* 38(12):1867-1876. Dec. 1981. In English with French summ. SFA 27(2)
[Minist. Nat. Resour., Fish. Br., Toronto, ON M7A 1W3, Canada]

82-000509 Kahan, D.; G. Uhlig; D. Schwenzer and L. Horowitz. A SIMPLE METHOD FOR CULTIVATING HARPACTICOID COPEPODS AND OFFERING THEM TO FISH LARVAE. *Aquaculture* 26(3-4):303-310. Jan. 1982. SFA 27(2)
[Dep. Zool., Hebrew Univ. Jerusalem, Jerusalem, Israel] Harpacticoid copepods were made more available to fish larvae by transfering them to mesh-bottomed floating trays. The mesh pore size, 80-100µm, allowed only the smaller stages (nauplii) to fall through and be preyed upon by first-day feeders of *Sparus aurata*. Preliminary experiments, using a mesh pore size of 36-45µm, were carried out in order to find out whether these trays could also serve as a culturing site. Densities obtained were 37-100 copepods/ml for *Schizopera elatensis, Tisbe holothuriae* and *Tisbe* sp. Propsects of using this method for culturing and offering desired developmental stages of copepods to fish larvae are discussed.

82-000510 Katoh, J. A CASE FOR FISHERIES ENGINEERING AND ITS APPLICATION TO THE PLANNING OF COASTAL AQUACULTURE FACILITIES IN JAPAN. *Aquacult. Eng.* 1(1):35-44. Jan. 1982. SFA 27(2)

## GENERAL FISH CULTURE (CONTINUED)

82-000510 CONTINUED

[Lab. Environ. Hydraul. Eng., Dep. Mar. Environ. Sci. Technol., Tokyo Univ. Fish., 5-7 Konan-4, Minato-ku, Tokyo 108, Japan] Fisheries engineering concerns the development of the fisheries industry. It has not yet been systematized because the problems raised are so diverse and it is not easy to provide an organic link between the biological and engineering sectors. This paper is intended to present a definition and the significance or characteristics of fisheries engineering and to propose a methodology for it. The gist of this paper is: (1) the aim of fisheries engineering is to build up the environmental conditions for the forms of marine life concerned and (2) the six basic points which are derived serve as principles which should be applied to any kind of problem.

82-000511 Kinghorn, B. P. CENTRAL SYSTEM FOR MONITORING THE QUALITY OF WATER FROM MANY SOURCES. *Prog. Fish-Cult.* 44(1):30-32. Jan. 1982. SFA 27(2)
[Res. Stn. Salmonids, 6600 Sunndalsøra, Norway]

82-000512 Lam, T. J. APPLICATIONS OF ENDOCRINOLOGY TO FISH CULTURE. *Can. J. Fish. Aquatic Sci.* 39(1):111-137. Jan. 1982. In English with French summ. SFA 27(2)
[Dep. Zool., Natl. Univ. Singapore, Singapore]

82-000513 Lam, T. J. FISH CULTURE IN SOUTHEAST ASIA. *Can. J. Fish. Aquatic Sci.* 39(1):138-142. Jan. 1982. In English with French summ. SFA 27(2)
[Dep. Zool., Natl. Univ. Singapore, Singapore]

82-000514 Larkin, P. A. AQUACULTURE IN NORTH AMERICA: AN ASSESSMENT OF FUTURE PROSPECTS. *Can. J. Fish. Aquatic Sci.* 39(1):151-154. Jan. 1982. In English with French summ. SFA 27(2)
[Inst. Anim. Resour. Ecol., Univ. British Columbia, Vancouver, BC V6T 1W5, Canada]

## TROUT AND SALMON CULTURE

82-000515 Billard, R. and M. Richard. INHIBITION OF SPERMATOGENESIS AND VITELLOGENESIS IN RAINBOW TROUT BY HORMONAL ADDITIVES IN THE DIET. *Prog. Fish-Cult.* 44(1):15-18. Jan. 1982. SFA 27(2)
[Lab. Fish. Physiol., Natl. Inst. Agron. Res., 78350 Jouy en Josas, France]

82-000516 Crone, R. A. POTENTIAL FOR PRODUCTION OF COHO SALMON (*ONCORHYNCHUS KISUTCH*) IN LAKES WITH OUTLET BARRIER FALLS, SOUTHEASTERN ALASKA. *Ph.D. dissertation, Univ. Mich.* 405p. 1981. From Diss. Abstr. Int. B Sci. Eng. 42(9):3507. Mar. 1982. SFA 27(2)

Three salmon-free lakes in southeastern Alaska, located above waterfalls that are barriers to upstream movement of fish, were stocked with young-of-the-year coho salmon (*Oncorhynchus kisutch*) to determine potential of such lakes to produce emigrant smolts. Two lakes were fishless; the third and largest contained Dolly Varden (*Salvelinus malma*). Coho fry were stocked at a density of 8,571/ha in 1.4-ha, shallow Tranquil Lake, whereas, in 15.3-ha Ludvik and 95.4-ha Osprey lakes, both deep and with steeply sloping bottoms, the rates were 6,677 and 2,893/ha, respectively.

## TROUT AND SALMON CULTURE (CONTINUED)

82-000516 CONTINUED Initially the young salmon grew rapidly while feeding almost exclusively on large-sized, indigenous zooplankters, including those found in the limnetic zone. As a result, macrozooplankter populations were decimated in only 2 to 8 weeks. The coho then switched to feeding on benthos and small-sized zooplankton, and slowed sharply in their growth. Only in Osprey did the initial period of rapid growth continue long enough (8 weeks) so that the great majority of coho exceeded the threshold size for smolting in the first growing season. Here, 91% of the smolts were age I at emigration and only 9% were age II. In contrast, in Tranquil these values were respectively 66 and 34%, and in heavily stocked Ludvik 46% left at age I, 6% at age II, 32% at age III, and 16% at age IV. Survival to emigration (age-I plus age-II smolts) totalled 57,7, and 58%, respectively, of the fry stocked in Tranquil, Ludvik, and Osprey. In Ludvik, through age IV, it doubled to 14%. Efficiency of production (percentage fo coho biomass produced in a lake that became the desired yield as spring emigrants) was high in Tranquil and Osprey (respectively, 86 and 73%). In Ludvik, efficiency was only 11% after 2 years and 30% after 4. The number of adults returning from age-I and age-II smolts equalled, respectively, 396 and 106/ha of lake surface for Tranquil, and 147 and 12/ha for Osprey. For Ludvik, annual adult yields from age-I through age-IV emigrants ranged from 2 to 30/ha. Adult returns totalled 6, 1, and 6% respectively, of the fry stocked in Tranquil, Ludvik, and Osprey. It is concluded that by stocking at conservative rates and at proper times, barriered lakes in southeastern Alaska (including those with Dolly Varden) have rewarding potential for rearing coho fry to smolts, with the ultimate result of increasing the number of harvestable adults.

82-000517 Helle, J. H. SIGNIFICANCE OF THE STOCK CONCEPT IN ARTIFICIAL PROPAGATION OF SALMONIDS IN ALASKA. *Can. J. Fish. Aquatic Sci.* 38(12):1665-1671. Dec. 1981. In English with French summ. SFA 27(2)
[NMFS, P.O. Box 155, Auke Bay, AK 99821]

82-000518 Mork, O. I. GROWTH OF THREE SALMOID SPECIES IN MONO AND DOUBLE CULTURE (*SALMO SALAR* L., *S. TRUTTA* L. AND *S. GAIRDNERI* RICH.). *Aquaculture* 27(2):141-147. Mar. 1982. SFA 27(2)
[Fiskerisjefen; Møre og Romsdal, Nedre Strandgt. 4, Boks 252, 6001 Ålesund, Norway] Juvenile Atlantic salmon, sea trout and rainbow trout were used in an experiment in which two species in each tank were compared with controls of each species separately. Specific growth rate was best in the experimental groups where the two species were reared together. The theory was developed that social facilitation or moderate interaction could cause the better growth. No starvation as a result of competition was discovered in any group.

82-000519 Raisanen, G. R. and D. J. Behmer. REARING LAKE WHITEFISH TO FINGERLING SIZE. *Prog. Fish-Cult.* 44(1):33-36. Jan. 1982. SFA 27(2)
[Biol. Chem. Dep., Lake Superior State Coll., Sault Ste. Marie, MI 49783]

82-000520 Sandercock, F. K., (chairman). PROCEEDINGS OF THE THIRTY-FIRST ANNUAL NORTHWEST FISH CULTURE CONFERENCE. *Proc. Northwest Fish Cult. Conf.* 31:1-241. 1980(1981). SFA 27(2)
A collection of papers.--RS

82-000521 Schreck, C. B. and L. G. Fowler. GROWTH AND REPRODUCTIVE DEVELOPMENT IN FALL CHINOOK SALMON: EFFECTS OF SEX HORMONES AND THEIR ANTAGONISTS. *Aquaculture* 26(3-4):253-263. Jan. 1982. SFA 27(2)
[Oreg. Coop. Fish. Res. Unit, Oreg. State Univ., Corvallis 97331]

## TROUT AND SALMON CULTURE (CONTINUED)

82-000522 Weatherley, A. H. and H. S. Gill. INFLUENCE OF BOVINE GROWTH HORMONE ON THE GROWTH DYNAMICS OF MOSAIC MUSCLE IN RELATION TO SOMATIC GROWTH OF RAINBOW TROUT, *SALMO GAIRDNERI* RICHARDSON. *J. Fish Biol.* 20(2):165-172. Feb. 1982. SFA 27(2)

[Life Sci. Div., Scarborough Coll., Univ. Toronto, West Hill, ON M1C 1A4, Canada] Bovine growth hormone (bGH), administered intramuscularly at 20 µg$^{-1}$ every 2 weeks, produced faster somatic growth in rainbow trout fingerlings to approximately 20 cm than in those not receiving the hormone. Both groups were maintained at 12°C, with a photoperiod of 16:8 LD, and on *ad libitum* rations daily. The faster growth was characterized by a controlled increase in input of fibres into the mosaic muscle (which dominates the body tissues by its bulk). It is not known if the enhanced input of fibres is an example of the known ability of the mosaic fibre mass to respond with flexibility and precision to widely differing somatic growth rates, or is a specific consequence of the growth hormone. In other fingerling trout receiving 4-5% daily rations and consequently growing slowly, bGH did not stimulate growth or evidently modify fibre input dynamics. Body dry weight, and condition (*K*), though modified by rations and growth rate, evidently had little effect on muscle fibre growth.

## WARMWATER CULTURE

82-000523 Barash, H.; I. Plavnik and R. Moav. INTEGRATION OF DUCK AND FISH FARMING: EXPERIMENTAL RESULTS. *Aquaculture* 27(2):129-140. Mar. 1982. SFA 27(2)

[Agric. Res. Organ., Inst. Anim. Sci., Volcani Cent., Bet Dagan, Israel] In 1977 and 1978, two fish ponds at the Dor Aquaculture Experiment Station were integrated with duck production. Each pond's area was 400 m$^2$ and they were stocked with a polyculture of common carp, Tilapia, silver carp and grass carp (White Amur). The ducks were fed with prepared, nutritionally balanced feed, while the fish had to get by with the ducks' droppings plus the feed dropped directly from the ducks' beaks into the ponds. The ducks' performance on the ponds was superior to their 'land' control in growth rate, feed efficiency, viability and cleanness of feathers and skin. The average daily gain of the fish was 38.5 kg ha$^{-1}$, not significantly different from ponds receiving similar mixtures of dry poultry manure plus supplementary feeds. Our experimental results provide necessary empirical support to the conclusion that the system is very efficient and its use should be expanded in warm water aquaculture.

82-000524 Bondari, K. CAGE PERFORMANCE AND QUALITY COMPARISONS OF TILAPIA AND DIVERGENTLY SELECTED CHANNEL CATFISH. *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:88-98. 1980[1981]. SFA 27(2)

[Dep. Entomol. Fish., Coastal Plain Exp. Stn., Univ. Ga., Tifton 31793] Six groups of cage-grown channel catfish (*Ictalurus punctatus*) and *Tilapia aurea* were compared for body weight, total length, condition factor, carcass characteristics, and sensory quality. Catfish used in this study were the first generation progeny of brood catfish selected for increased and decreased body weight and for body weight variability at 48-week post-spawning age. A random-bred control line and a group of pond-raised catfish were also included in the experiment. Results indicated that 1 generation of divergent selection has increased body weight and body weight variability in the upward lines but no declines were observed in the downward lines. Selection for improved growth rate may also produce catfish more uniform in size. In the taste test tilapia were preferred over catfish.

82-000525 Crawford, T. G. and J. K. Beadles. INTENSIVE CULTURE OF WHITE AMUR IN CAGES. *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:99-107. 1980[1981]. SFA 27(2)

WARMWATER CULTURE (CONTINUED)

82-000525 CONTINUED
[Dep. Biol. Sci., Ark. State Univ., State University 72467] From 3 May 1979 through 9 November 1979, cage culturing of fingerling white amur, *Ctenopharyngodon idella* was conducted utilizing alfalfa pellets, catfish pellets, alfalfa and bermuda grass hay or aquatic vegetation as feeds. Feed utilizations, feed conversion ratios and growth rates were analyzed. Feed conversion rations ranged from 10:1 to 30:1. Fish fed the catfish pellets or hay yielded poor growth. Those fed the alfalfa pellets were larger and achieved the expected stocker size. Mortality was a problem throughout the study period. Handling stress, agonistic behavior, and bacterial and fungal infections appeared to have been the causative agents.

82-000526 Epler, P.; K. Bieniarz and E. Marosz. **THE EFFECT OF LOW DOSES OF CARP HYPOPHYSIAL HOMOGENATE AND SOME STEROID HORMONES ON CARP (*CYPRINUS CARPIO* L.) OOCYTE MATURATION IN VITRO.** *Aquaculture* 26(3-4):245-251. Jan. 1982. SFA 27(2)
[Acad. Agric., Dep. Ichthyol. Fish., Krakow-Mydlniki, Rybacka Stacja Doświadczalna, Poland] Studies on the in vitro incubation of carp oocytes have shown that low doses (10.0-50.0μg/ml of medium) of carp hypophysial homogenate (c.h.h.) do not induce complete maturation. Steroid hormones at 1μg/ml used alone stimulate only a percentage of oocytes to reach full maturation. Low doses of carp hypophysial homogenate (added to the culture at the beginning of incubation) and steroid hormones (added 6h later) induce maturation in over 40% of oocytes. The highest percentage of mature oocytes was obtained in the cultures to which were added carp hypophysial homogenate at 30-40μg/ml of medium and 17α-hydroxy-20β-dihydroprogesterone (17α20βP) (1μg/ml of medium) 6h later. The results are discussed in connection with their application in artificial spawning of carp.

82-000527 Henderson-Arzapalo, A. and R. R. Stickney. **EFFECTS OF STOCKING DENSITY ON TWO TILAPIA SPECIES RAISED IN AN INTENSIVE CULTURE SYSTEM.** *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:379-387. 1980[1981]. SFA 27(2)
[Dep. Wildl. Fish. Sci., Tex. A&M Univ., College Station 77843] *Tilapia aurea* and *T. mossambica* fry were stocked in a flowing system at varying stocking densities (5, 10, 20, 30, 40, 50 and 60 fish/tank in 60 liters of water) in an intensive tank culture system. The fish were maintanied for 115 days on commercial pelleted feed. In terms of length increase, weight gain, condition, total yield, and food conversion rates, *T. aurea* performed significantly better than *T. mossambica* at all stocking densities. The *T. mossambica* experienced much higher mortality and reduced growth due to an auto-immune reaction related to stocking density, which effectively limits the density at which this species can be stocked. Hypersensitivity reactions began when the biomass reached about 20g/liter with a turnover time of one-half hour, although further research is needed to completely quantify their crowding tolerance limits. *T. aurea* were still growing and feeding vigorously at termination of the experiment (with a maximum biomass of 66.2g/liter) and probably could have continued to grow to even greater biomass. *T. aurea* is preferable to *T. mossambica* in intensive fish culture or in tilapia polyculture due to the former's higher yields and greater resistance to crowding.

82-000528 Hulata, G.; R. Moav and G. Wohlfarth. **EFFECTS OF CROWDING AND AVAILABILITY OF FOOD ON GROWTH RATE OF FRY IN THE EUROPEAN AND CHINESE RACES OF THE COMMON CARP.** *J. Fish Biol.* 20(3):323-327. Mar. 1982. SFA 27(2)
[Agric. Res. Organ., Inst. Anim. Sci., Fish. Aquacult. Res. Stn., Dor. D.N. Hoff Hacarmel 30820, Israel] Fry of the European and Chinese races of the common carp and interracial crossbred fry were grown together in a series of ponds for 28 days after hatching. The degree of crowding and the amount of available natural food were intentionally varied in these experimental ponds. This resulted in a large variation in mean growth between ponds, ranging from

## WARMWATER CULTURE (CONTINUED)

82-000528 CONTINUED 0.1 to 5.2g per fish during the 28 days growth period. Under conditions of very slow growth, resulting from severe crowding and lack of natural food, fry of the Chinese carp grew several times faster than European carp. At lower densities and when natural food was more abundant, resulting in a faster rate of growth, this difference between the two races disappeared. Crossbred fry between the Chinese and European carp grew faster than either of their parents under all conditions tested.

82-000529 Koops, H. and H. Kuhlmann. GRADING OF FARMED EELS BY MEANS OF MESHWIRE BOXES. *Aquacult. Eng.* 1(1):11-21. Jan. 1982. SFA 27(2)
[Inst. Küsten-Binnenfisch. Bundesforschungsanst. Fisch., Hamburg, West Germany] This paper described the successful grading of farmed eels using square meshed box screens. The grading curves for yellow and silver eels are evaluated for the square mesh sizes: 10, 16, 20 and 25mm while some indication is given to the location of the sexes within these gradings.

82-000530 Lin, H.-R. POLYCULTURAL SYSTEM OF FRESHWATER FISH IN CHINA. *Can. J. Fish. Aquatic Sci.* 39(1):143-150. Jan. 1982. In English with French summ. SFA 27(2)
[Dep. Biol., Zhongshan (Sun Yatsen) Univ., Guangzhou, China]

82-000531 Lone, K. P. and A. J. Matty. THE EFFECT OF FEEDING 11-KETOTESTOSTERONE ON THE FOOD CONVERSION EFFICIENCY AND TISSUE PROTEIN AND NUCLEIC ACID CONTENTS OF JUVENILE CARP, *CYPRINUS CARPIO* L. *J. Fish Biol.* 20(1):93-104. Jan. 1982. SFA 27(2)
[Dep. Biol. Sci., Univ. Aston in Birmingham, Birmingham B4 7ET, England]

82-000532 Meriwether, F. II. INDUCTION OF POLYPLOIDY IN ISRAELI CARP. *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:275-279. 1980[1981]. SFA 27(2)
[Dep. Fish. Allied Aquacult., Auburn Univ., Auburn, AL 36849] Israeli carp (*Cyprinus carpio*) eggs were cold-shocked after fertilization at various temperature regimes and durations. Nine months later their blood was sampled for analysis. Stained erythrocyte nuclei were measured with an ocular micrometer to calculate mean relative areas. Polyploidy appeared to have been induced in each cold-shock group, but no group appeared to consist entirely of polyploids. Gonadal examination showed no apparent differences between the control group and the cold-shocked groups.

82-000533 Msiska, O. V. REARING OF THE FRY OF THE AFRICAN CATFISH, *CLARIAS LAZERA* (C&V) USING LIVE AND ARTIFICAL FEEDSTUFFS. *Bamidgeh* 33(4):122-127. Dec. 1981. SFA 27(2)
[Fish. Dep., P.O. Box 44, Domasi, Malawi] An experiment was conducted to rear the fry of the African catfish, *Clarias lazera* (C.&V.) in aquaria using trout starter or chicken feed supplemented during the first two weeks with either *A. salina* nauplii or zooplankton in a live, frozen or freeze-dried form. It showed that feeding with live natural organisms during the first period was essential, both *Artemia* and zooplankton giving acceptable results, processing of the organisms decreased the food value significantly ($P < 0.05$). Trout starter gave better results ($P < 0.001$) as a staple food than did the chicken mash, but the latter also held perspective.

82-000534 Ram, N. M.; O. Zur and Y. Avnimelech. MICROBIAL CHANGES OCCURRING AT THE SEDIMENT-WATER INTERFACE IN AN INTENSIVELY STOCKED AND FED FISH POND. *Aquaculture* 27(1):63-72. Feb. 1982. SFA 27(2)
[Dep. Civ. Eng., Univ. Mass., Amherst 01003]

## WARMWATER CULTURE (CONTINUED)

82-000535 Reagan, R. E., Jr. SURVEY OF CURRENT PRACTICES AND PROBLEMS IN THE MISSISSIPPI CATFISH INDUSTRY. *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:127-130. 1980[1981]. SFA 27(2)
[Dep. Wildl. Fish., Miss. State Univ., Mississippi State 39762]

82-000536 Rothbard, S. INDUCED REPRODUCTION IN CULTIVATED CYPRINIDS - THE COMMON CARP AND THE GROUP OF CHINESE CARPS: 1. THE TECHNIQUE OF INDUCTION, SPAWNING AND HATCHING. *Bamidgeh* 33(4):103-121. Dec. 1981. SFA 27(2)
[Fish Aquacult. Stn., Dor, Israel]

82-000537 Sutton, R. J. and W. M. Lewis. FURTHER OBSERVATIONS ON A FISH PRODUCTION SYSTEM THAT INCORPORATES HYDROPONICALLY GROWN PLANTS. *Prog. Fish-Cult.* 44(1):55-59. Jan. 1982. SFA 27(2)
[Environ. Res. Technol., Inc., 1716 Heath Parkway, Fort Collins, CO 80524]

82-000538 Van Gorder, S. D. and J. D. Fritch. FILTRATION TECHNIQUES FOR SMALL-SCALE AQUACULTURE IN A CLOSED SYSTEM. *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:59-66. 1980[1981]. SFA 27(2)
[Rodale Press, Inc., Organic Garden. Farm. Res. Cent., Kutztown, PA 19530] Recirculating 2271-liter culture systems were designed and evaluated as potential fish production units. System components include a culture tank, sedimentation basin, and a biological filter. Three different biological filter types were compared: a commercially available plastic filter media, a rotating biodisc filter, and a submerged gravel filter. Each duplicated system was stocked with 5 cm fingerling channel catfish, *Ictalurus punctatus*, which were fed daily. The experiment continued until maximum loading capacities were attained. In the 155 day growing period, the greatest standing crop attained was 41.2kg using the rotating biodisc filter. Excepting one replication which exhibited 100 percent mortality due to an aerator failure, survival rate was 95 percent or greater, with feed conversions ranging from 1.27 to 1.62.

## MARICULTURE

82-000539 Fuchs, J. PRODUCTION DE JUVENILES DE SOLE (*SOLEA SOLEA*) EN CONDITIONS INTENSIVES. I. LE PREMIER MOIS D'ELEVAGE. [THE PRODUCTION OF JUVENILE SOLE (*SOLEA SOLEA*) UNDER INTENSIVE CONDITIONS. I. THE FIRST MONTH OF REARING.] *Aquaculture* 26(3-4):321-337. Jan. 1982. In French with English summ. SFA 27(2)
[France Aquacult., c/o Soc. Itticolt. Meridion., Via Wagner, 10 Palermo, Italy] Trials with soles of age 0 to 1 month carried out in 1977 and 1978 are described. The aim was to improve and simplify the rearing method proposed by Girin (1978). The quantity of alevins produced was about 15000 to 20000 per 2-m$^3$ tank and survival and growth were comparable with the best results obtained thus far in small volumes (70-80% for survival, 50-80 mg for average weight). Precise quantification of conditions of feeding (quality and quantity), rearing conditions and environmental factors (aeration, photoperiod, type and shape of the tanks) for larvae (0-15 days) and juveniles (15-30 days) allow us to consider the rearing of this species to be well controllable up to the end of the first month. On the basis of the results it is possible to envisage the extension of this rearing method to the production of many hundreds of thousands of individuals without the strict conditions of the laboratory.

82-000540 Hope, S. J. HOLDING ATLANTIC MENHADEN IN A CLOSED SYSTEM FOR ENVIRONMENTAL RESEARCH. *Prog. Fish-Cult.* 44(1):50-52. Jan. 1982. SFA 27(2)
[Stone and Webster Eng. Corp., 245 Summer St., Boston, MA 02107]

## MARICULTURE (CONTINUED)

82-000541 Poxton, M. G.; K. R. Murray and B. T. Linfoot. THE GROWTH OF TURBOT (*SCOPHTHALMUS MAXIMUS* (L.)) IN RECIRCULATING SYSTEMS. *Aquacult. Eng.* 1(1):23-34. Jan. 1982. SFA 27(2)

[Dep. Brewing Biol. Sci., Heriot-Watt Univ., Chambers St., Edinburgh, EH1 1HX, Scotland] 0-group wild turbot (*Scophthalmus maximus* (L.)) were used in a number of feeding experiments designed to assess the usefulness of readily available species of industrial fish as feed for the ongrowing stage of cultivation (10-500g). Sprats (*Sprattus sprattus* (L.)) and sandeels (*Ammodytes marinus* Raitt) were the most successful in that feeding rates of 2% live weight per feed gave conversion efficiencies which were generally better than 3:1. A regular regime of two feeds a day should give growth rates approaching 2% per day resulting in an ongrowing period of about 200 days at 16°C. The turbot were maintained in closed recirculating systems using a simple design for the treatment units. These provided a stable environment in which to conduct the experiments the average water quality conditions being given. There were few health problems and the taste and texture of the fish produced appeared to be good.

## FEEDS, FEEDING, AND NUTRITION

82-000542 Dabrowski, K.; K. Krasnicki and H. Kozlowska. RAPESEED MEAL IN THE DIET FOR COMMON CARP REARED IN HEATED WATERS. III. METAL CONCENTRATIONS IN TISSUES. *J. Anim. Physiol. Anim. Nutr.* 46(5):273-282. 1981. In English with German summ. SFA 27(2)

[Inst. Ichthyobiol. Fish., Acad. Agric. Technol., 10-957 Olsytyn-Kortowo, Poland]

82-000543 Evenson, E. J. and K. C. Kruse. EFFECTS OF A DIET OF BULLFROG LARVAE ON THE GROWTH OF LARGEMOUTH BASS. *Prog. Fish-Cult.* 44(1):44-46. Jan. 1982. SFA 27(2)

[N.J. Dep. Environ. Prot., Div. Water Resour., P.O. Box CN-029, Trenton 08625]

82-000544 Foltz, J. W.; J. M. Gibson and J. T. Windell. EVALUATION OF TILAPIA MEAL FOR FISH DIETS. *Prog. Fish-Cult.* 44(1):8-11. Jan. 1982. SFA 27(2)

[Dep. Entomol. Fish. Wildl., Clemson Univ., Clemson, SC 29631]

82-000545 Fuchs, J. PRODUCTION DE JUVENILES DE SOLE (*SOLEA SOLEA*) EN CONDITIONS INTENSIVES. II. TECHNIQUES DE SEVRAGE ENTRE 1 ET 3 MOIS. [THE PRODUCTION OF JUVENILE SOLE (*SOLEA SOLEA*) UNDER INTENSIVE CONDITIONS. II. METHODS OF WEANING BETWEEN 1 AND 3 MONTHS.] *Aquaculture* 26(3-4):339-358. Jan. 1982. In French with English summ. SFA 27(2)

[France Aquacult., c/o Soc. Itticolt. Meridion., Via Wagner, 10 Palermo, Italy] Weaning Dover sole fry on inert feed remains the main difficulty in the culture of this species. Starting from the rearing method proposed by Girin (1978), the results were improved and the volume of the tanks was increased. In 2-m$^3$ fiberglass tanks, the survival of fry weaned to frozen natural feed (Artemia, polychaetes and bivalves) at the age of 25 days reached 70% at the age of 90 days (50% from hatching) with an average weight of 0.8g; with a dry pellet offered after the age of 30 days, survival did not exceed 40% at the age of 90 days (25% from hatching) but the average weight reached 1.4g. Moist diets, based on bivalve and fish flesh, were also successfully tested. In the figerglass tanks used, the density at the age of 25 days could be increased between 1000 and 1500 fry/m$^2$, providing productions of 300-5000 weaned 90-days-old juvenile fish per 2-m$^3$ tanks.

## FEEDS, FEEDING, AND NUTRITION (CONTINUED)

82-000546 Gatesoupe, F.-J. and J. H. Robin. THE DIETARY VALUE FOR SEA-BASS LARVAE (*DICENTRARCHUS LABRAX*) OF THE ROTIFER *BRACHIONUS PLICATILIS* FED WITH OR WITHOUT A LABORATORY-CULTURED ALGA. *Aquaculture* 27(2):121-127. Mar. 1982. SFA 27(2)
[Inst. Nat. Rech. Agron., Cent. Rech. Hydrobiol., Lab. Nutr. Poissons, Saint-Pée-sur-Nivelle, 64310 Ascain, France]

82-000547 Gatesoupe, F.-J. and P. Luquet. WEANING OF THE SOLE (*SOLEA SOLEA*) BEFORE METAMORPHOSIS. *Aquaculture* 26(3-4):359-368. Jan. 1982. SFA 27(2)
[INRA, Cent. Rech. Hydrobiol., Lab. Nutr. Poissons, Saint-Pee-sur-Nivelle 64310 Ascain, France] Sole larvae were given live *Artemia* nauplii only during their first few days of life. They were then fed on artificial diet, semi-moist and crumbly in form. Good results were obtained without supply of frozen nauplii (15 and 28% survivors from hatching up to day 70, respectively for two lots abruptly weaned from day 10 or 11, with 50 and 90mg as the final mean weight, and a supply of 1980 or 2660 live nauplii per 70-day-old fish). Gradual weaning was also tried, supplying frozen nauplii for the first 5 days of inert feeding. The best weaning was also found to be the latter one, i.e. with frozen nauplii being given from day 11 to day 15. This produced 49% survivors from hatching up to day 50. A total of 2800 live nauplii was required per sole at this stage. But the growth rate, 27 mg as the mean weight by day 50, was unsatisfactory. In addition, the pigmentation of sole from the three tested batches of eggs was observed. The proportion of normally pigmented sole at the end of the experiments was between 13 and 70%. The differences between lots from the same spawning were found to be significant. This would indicate that unchecked rearing conditions might produce the very high level of pigmentary anomalies generally observed in the rearing of flatfish.

82-000548 Gatlin, D. M. III and R. R. Stickney. FALL-WINTER GROWTH OF YOUNG CHANNEL CATFISH IN RESPONSE TO QUANTITY AND SOURCE OF DIETARY LIPID. *Trans. Am. Fish. Soc.* 111(1):90-93. Jan. 1982. SFA 27(2)
[Dep. Biochem., Miss. State Univ., Mississippi State 39759]

82-000549 Ina, K.; Ohsuga, H. and Y. Suzuki. [EFFECT OF PLANT PROTEIN ON GROWTH OF RED SEA BREAM, *CHRYSOPHRYS MAJOR*.] *Bull. Jpn. Soc. Sci. Fish.* 47(10):1351-1354. Oct. 1981. In Japanese with English summ. SFA 27(2)
[Dep. Agric. Chem., Fac. Agric., Shizuoka Univ., 836, Ohya, Shizuoka 420, Japan]

82-000550 Jackson, A. J.; B. S. Capper and A. J. Matty. EVALUATION OF SOME PLANT PROTEINS IN COMPLETE DIETS FOR THE TILAPIA *SAROTHERODON MOSSAMBICUS*. *Aquaculture* 27(2):97-109. Mar. 1982. SFA 27(2)
[Dunstaffnage Mar. Res. Lab., P.O. Box 3, Oban, Argyll, Scotland]

82-000551 Jauncey, K. THE EFFECTS OF VARYING DIETARY PROTEIN LEVEL ON THE GROWTH, FOOD CONVERSION, PROTEIN UTILIZATION AND BODY COMPOSITION OF JUVENILE TILAPIAS (*SAROTHERODON MOSSAMBICUS*). *Aquaculture* 27(1):43-54. Feb. 1982. SFA 27(2)
[Inst. Aquacult., Univ. Stirling, Stirling FK9 4LA, Scotland] The effects of varying dietary protein level on several nutritional parameters of *Sarotherodon mossambicus* were studied. Eight approximately isoenergetic diets were formulated with protein levels ranging from 0% to 56% in increments of 8%. A zero protein diet was included so that true digestibility, Net Protein Utilization (NPU) and Biological Values (BV) were determined. Specific growth rates (%/day) were: 40% protein (3.85) > 48% protein (3.49), 56% protein (3.51) > 32% protein (3.04), 24% protein

## FEEDS, FEEDING, AND NUTRITION (CONTINUED)

82-000551 CONTINUED (3.10) > 16% protein (2.46) > 8% protein (1.32) > 0% protein (-0.16). Food conversion decreased with increasing dietary protein levels, although not significantly above 40%. Protein efficiency ratio, NPU and BV all decreased with increasing dietary protein level whilst carcass analysis and protein digestibility were little affected. The minimum dietary protein level producing maximum growth of *S. mossambicus* was found to be 40%, with a dietary protein to energy ratio (P : E) of 116.6 mg protein per kilocalorie of calculated metabolizable energy.

82-000552 Knox, D.; C. B. Cowey and J. W. Adron. EFFECTS OF DIETARY COPPER AND COPPER: ZINC RATIO ON RAINBOW TROUT *SALMO GAIRDNERI*. *Aquaculture* 27(2):111-119. Mar. 1982. SFA 27(2)
[Inst. Mar. Biochem., St. Fittick's Rd., Torry, Aberdeen AB1 3RA, Scotland]

82-000553 Marian, M. P.; A. G. Ponniah; R. Pitchairaj and M. Narayanan. EFFECT OF FEEDING FREQUENCY ON SURFACING ACTIVITY AND GROWTH IN THE AIR-BREATHING FISH, *HETEROPNEUSTES FOSSILIS*. *Aquaculture* 26(3-4):237-244. Jan. 1982. SFA 27(2)
[Sch. Biol. Sci., Madurai Kamaraj Univ., Madurai 625 021, India] Juveniles of *Heteropneustes fossilis* (4.5±0.35g) were fed twice a day, once a day, once in 2 days, once in 3 days, once in 7 days or had no food at all for a total period of 21 days. Food consumption by the group fed once in 2 days was the greatest (327 gcal/meal); the level of consumption per meal was around 240 gcal in the remaining groups. With increasing feeding frequency, the overall feeding rate incrased to 65 gcal/g live weight per day in the group fed twice a day. Growth rate was the highest (8.7 gcal/g per day) in the groups fed twice and once in a day, moderate (3.4 gcal/g per day) in that fed once in 2 days and zero or negative in that fed once in 3 days, and in other groups the individuals had negative growth. Growth efficiency was highest (17%) in the group fed twice a day, which surfaced more frequently than the remaining groups. From the points of both feeding and conversion efficiency, feeding once a day in cultures of juvenile *H. fossilis* is recommended.

82-000554 Mathias, J. A.; J. Martin; M. Yurkowski; J. G. I. Lark; M. Papst and J. L. Tabachek. HARVEST AND NUTRITIONAL QUALITY OF *GAMMARUS LACUSTRIS* FOR TROUT CULTURE. *Trans. Am. Fish. Soc.* 111(1):83-89. Jan. 1982. SFA 27(2)
[Dep. Fish. Oceans, Freshwater Inst., 501 University Crescent, Winnipeg, MB R3T 2N6, Canada]

82-000555 Murai, T.; H. Ogata and T. Nose. METHIONINE COATED WITH VARIOUS MATERIALS SUPPLEMENTED TO SOYBEAN MEAL DIET FOR FINGERLING CARP *CYPRINUS CARPIO* AND CHANNEL CATFISH *ICTALURUS PUNCTATUS*. *Bull. Jpn. Soc. Sci. Fish.* 48(1):85-88. Jan. 1982. SFA 27(2)
[Div. Fish. Nutr., Natl. Res. Inst. Aquacult., Hiruta, Tamaki, Watarai, Mie 519-04, Japan]

82-000556 Pigott, G. M. THE ROLE OF A FOOD ENGINEER IN FISH DIET RESEARCH AND FORMULA DEVELOPMENT. *Aquacult. Eng.* 1(1):71-79. Jan. 1982. SFA 27(2)
[Inst. Food Sci. Technol., Univ. Wash., Coll. Fish., Seattle 98195]

82-000557 Robinette, H. R.; M. W. Brunson and E. J. Day. USE OF DUCKWEED IN DIETS OF CHANNEL CATFISH. *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:108-114. 1980[1981]. SFA 27(2)
[Dep. Wildl. Fish., Miss. State Univ., Mississippi State 39762] Duckweed (Family Lemnaceae) was incorporated into 6 isocaloric diets which were fed for 10 weeks to channel catfish (*Ictalurus punctatus*) fingerlings in

## FEEDS, FEEDING, AND NUTRITION (CONTINUED)

82-000557 CONTINUED aquaria. Three diets contained surplus essential amino acids while utilizing duckweed at 0, 15, and 20 percent of the diet. Three other diets had the same levels of duckweed, but contained borderline levels of amino acids. No significant difference in mean weight gain per fish was found within each group of 3 diets. Feed conversion and kcal of energy required per *g* of weight gain were not statistically different for the fish fed the 6 diets.

82-000558 Snow, J. R.; T. A. Al-Ahmad and J. E. Parsons. ROTIFERS AS A PRODUCTION DIET FOR STRIPED BASS FINGERLINGS. *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:280-291. 1980[1981]. SFA 27(2)
[Dep. Fish. Allied Aquacult., Auburn Univ., Auburn, AL 36849] Growth of striped bass *Morone saxatilis* fry on a diet of rotifers were studied in the laboratory and in the field. Although the rate of growth was slower when rotifers were the principal food than when other acceptable zooplankton were eaten, rotifers were judged to be acceptable as a starting diet. This was based upon the fact that survival was higher and more consistent from pond to pond than was the case when mixed zooplankton was the source of food initially. Trichlorfon as Mesoten ® was used in rearing ponds to reduce predaceous and competitive invertebrates and to favor development of the rotifer population.

82-000559 Soebiantoro, B. REPLACEMENT OF BRINE SHRIMP NAUPLII WITH ARTIFICAL DIETS FOR FEEDING STRIPED BASS LARVAE. *Ph.D. dissertation, Auburn Univ.* 90p. 1981. From Diss. Abstr. Int. B Sci. Eng. 42(8):3045. Feb. 1982. SFA 27(2)
Results from the study indicate that striped bass fry can utilize a properly prepared dry diet after 4 to 10 days of priming on live brine shrimp, depending on the quality of the newly-hatched larvae. Palatability and physical properties of the dry diet were satisfactory as indicated by the relatively high incidence of feeding by fry fed these diets. The factor in brine shrimp nauplii which promotes growth of larval fish is not heat stable.--From abstr.

82-000560 Viola, S.; S. Mokady; U. Rappaport and Y. Arieli. PARTIAL AND COMPLETE REPLACEMENT OF FISHMEAL BY SOYBEAN MEAL IN FEEDS FOR INTENSIVE CULTURE OF CARP. *Aquaculture* 26(3-4):223-236. Jan. 1982. SFA 27(2)
[Miloubar Cent. Feedmill, D.N. Asherat, Israel] Feeding experiments with carp were performed in plastic tanks, in cages and in experimental ponds, using pelleted rations of 25% total crude protein. Fishmeal was the only source of supplemental protein in the control ration, besides the basal ground grains. Partial replacement (40% of the fishmeal) by soybean meal in pond trials required only supplements of methionine and 5% oil in order to attain the same growth, protein and energy utilisation as with the control ration. When most or all of the fishmeal was replaced by soybean meal, supplements of methionine, 0.4-0.5% lysine and 10% oil were necessary to achieve gains, protein efficiency ratio (PER), net protein utilization (NPU), protein retentions and energy retentions equal to those of the control fishmeal ration. It was concluded that regular soybean meal contains 10-15% less available energy and 10-15% less available lysine for carp than the generally accepted values (as in NRC-NAS, Nutrient Requirements of Poultry, 1977).

82-000561 Watanabe, T.; M. Wada; T. Takeuchi and S. Arai. [ABSENCE OF INTERCONVERSION OF TOCOPHEROLS IN RAINBOW TROUT.] *Bull. Jpn. Soc. Sci. Fish.* 47(11):1455-1462. Nov. 1981. SFA 27(2)
[Lab. Fish. Nutr., Tokyo Univ. Fish., Konan-4, Minato, Tokyo 108, Japan]

## FEEDS, FEEDING, AND NUTRITION (CONTINUED)

82-000562 Watanabe, T.; T. Takeuchi and M. Wada. DIETARY LIPID LEVELS AND α-TOCOPHEROL REQUIREMENT OF CARP. *Bull. Jpn. Soc. Sci. Fish.* 47(12):1585-1590. Dec. 1981. SFA 27(2)
[Lab. Fish Nutr., Tokyo Univ. Fish., Konan-4, Minato, Tokyo 108, Japan]

82-000563 Watanabe, T.; T. Takeuchi; M. Wada and R. Uehara. THE RELATIONSHIP BETWEEN DIETARY LIPID LEVELS AND α-TOCOPHEROL REQUIREMENT OF RAINBOW TROUT. *Bull. Jpn. Soc. Sci. Fish.* 47(11);1463-1471. Nov. 1981. SFA 27(2)
[Lab. Fish. Nutr., Tokyo Univ. Fish., Konan-4, Minato, Tokyo 108, Japan]

82-000564 Willis, D. S. and S. A. Flickinger. COMMON CARP EGGS AS A STARTER DIET FOR THE INTENSIVE CULTURE OF SMALLMOUTH BASS FRY. *Prog. Fish-Cult.* 44(1):28-29. Jan. 1982. SFA 27(2)
[Kans. Fish Game Comm., Winfield State Bank Bldg., Winfield 67156]

## TRANSPORTING FISH

82-000565 Barton, B. A. and R. E. Peter. PLASMA CORTISOL STRESS RESPONSE IN FINGERLING RAINBOW TROUT, *SALMO GAIRDNERI* RICHARDSON, TO VARIOUS TRANSPORT CONDITIONS, ANAESTHESIA, AND COLD SHOCK. *J. Fish Biol.* 20(1):39-51. Jan. 1982. SFA 27(2)
[Fish. Br., Minist. Nat. Resour., Queen's Park, Toronto, ON M7A 1W3, Canada] Plasma cortisol levels of fingerling rainbow trout were measured as an index of the stress resulting from various procedures used for transport of the fish for stocking. When transported under 'normal' conditions, which included water at the hatchery acclimation temperature (10-11°C), $O_2$ saturation or supersaturation, and neutral pH, there was a marked increase in plasma cortisol levels within 0.5h, which was maintained over the next 4h of transport; there was a significant decrease in plasma cortisol by 8h of transport. It was found that the plasma cortisol levels at 4 and 8h were not appreciably altered by transport under partial $O_2$ desaturation, $O_2$ saturation, $O_2$ supersaturation, or 0.5% NaCl, or by anaesthesia with tricaine methanesulfonate (MS 222) prior to capture and transport in MS 222-free water or 0.5% NaCl. A 15 min exposure to an immobilizing dose of buffered or unbuffered MS 222, or 2-phenoxyethanol, caused an increase in plasma cortisol of about 2h duration, indicating that anaesthetics are themselves stressful. Exposure to chilled water (1°C) caused a large increase in plasma cortisol levels by 4h after initiation of exposure; plasma cortisol had decreased at 1 day, and by 2 days a constant level was reached which was above the level in fingerling trout under 'normal' hatchery conditions. Trout acclimated to chilled water for 24h and transported in chilled water had an increase in plasma cortisol during transport. Anaesthesia prior to transport or addition of salt did not reduce the stress of transport as judged by plasma cortisol levels. The results indicate that stress from capture and transport during stocking cannot be avoided using present methods.

82-000566 Bower, C. E. and D. T. Turner. AMMONIA REMOVAL BY CLINOPTILOLITE IN THE TRANSPORT OF ORNAMENTAL FRESHWATER FISHES. *Prog. Fish-Cult.* 44(1):19-23. Jan. 1982. SFA 27(2)
[Sea Res. Found. Inst. Aquarium Stud., P.O. Box 7-495, West Hartford, CT 06107

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82-000567 Johnson, D. L. and M. T. Metcalf. CAUSES AND CONTROLS OF FRESHWATER DRUM MORTALITY DURING TRANSPORTATION. *Trans. Am. Fish. Soc.* 111(1):58-62. Jan. 1982. SFA 27(2)
[Div. Fish. Wildl. Manage., Ohio State Univ., Columbus 43210]

## MISCELLANEOUS CULTURE TECHNIQUES AND EQUIPMENT

82-000568 Carignan, R. AN EMPIRICAL MODEL TO ESTIMATE THE RELATIVE IMPORTANCE OF ROOTS IN PHOSPHORUS UPTAKE BY AQUATIC MACROPHYTES. *Can. J. Fish. Aquatic Sci.* 39(2):243-247. Feb. 1982. In English with French summ. SFA 27(2)
[Natl. Water Res. Inst., Can. Cent. Inland Waters, P.O. Box 5050, Burlington, ON L7R 4A6, Canada]

82-000569 Chervinski, J. and S. Rothbard. AN AID IN MANUALLY SEXING *TILAPIA*. *Aquaculture* 26(3-4):389. Jan. 1982. SFA 27(2)
[Fish. Aquacult. Res. Stn., Dor, D.N. Hof-Hacarmel, 30820, Israel]

82-000570 Donaldson, E. M. and G. A. Hunter. SEX CONTROL IN FISH WITH PARTICULAR REFERENCE TO SALMONIDS. *Can. J. Fish. Aquatic Sci.* 39(1):99-110. Jan. 1982. In English with French summ. SFA 27(2)
[West Vancouver Lab., Resour. Serv. Br., Dep. Fish. Oceans, 4160 Marine Dr., West Vancouver, BC V7V 1N6, Canada]

82-000571 Kinghorn, B. P. WATER FLOW CONTROLLER. *Prog. Fish-Cult.* 44(1):48-49. Jan. 1982. SFA 27(2)
[Res. Stn. Salmonids, 6600 Sunndalsøra, Norway]

82-000572 Meriwether, F. H. II and W. L. Shelton. OBSERVATION ON AQUARIUM SPAWNING OF ESTROGEN-TREATED AND UNTREATED TILAPIA. *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:81-87. 1980[1981]. SFA 27(2)
[Ala. Coop. Fish Res. Unit, Auburn Univ., Auburn, AL 36849]

82-000573 Wisely, B.; J. E. Holliday and R. E. MacDonald. HEATING AN AQUACULTURE POND WITH A SOLAR POOL BLANKET. *Aquaculture* 26(3-4):385-387. Jan. 1982. SFA 27(2)
[New South Wales, Fish Res. Stn., Salamander Bay, N.S.W. 2301, Australia] A floatig solar blanket of laminated bubble plastic was used to heat a 0.11 ha seawater pond of 1.3m depth. The covered pond maintained daily temperatures 6 to 9°C above two controls. Local air temperatures averaged 14 to 19°C. Oysters, prawns, seasquirts, and fish in the covered pond all survived. After three weeks, the blanket separated. This was the result of pond temperatures exceeding 30°C, the maximum manufacturer's specification. Floating blankets fabricated to higher specifications would be useful for maintaining above-ambient temperatures in small ponds or tanks in temporary situations during cold winter months and might have a more permanent use.

82-000574 Withler, F. C. CRYOPRESERVATION OF SPERMATOZOA OF SOME FRESHWATER FISHES CULTURED IN SOUTH AND SOUTHEAST ASIA. *Aquaculture* 26(3-4):395-398. Jan. 1982. SFA 27(2)
[Dep. Fish. Oceans, Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada] The activity and fertilizing ability of spermatozoa of Indian carp *Labeo rohita*, common carp *Cyprinus carpio*, tawes carp *Puntius gonionotus*,

## MISCELLANEOUS CULTURE TECHNIQUES AND EQUIPMENT (CONTINUED)

82-000574 CONTINUED grass carp *Ctenopharyngodon idella*, bighead carp *Aristichthys nobilis*, and the catfish *Pangasius sutchi* were tested after freezing and storage in liquid nitrogen. Spermatozoa of Indian, common, tawes, and bighead carps were activited successfully after periods up to 26 days. Activated Indian carp semen fertilized ova as effectively as fresh semen. Preserved semen of *P. sutchi* produced a gel and could not be used effectively in fertilizing ova.

## GENERAL LIMNOLOGY AND OCEANOGRAPHY

82-000575 Lindsey, C. C.; K. Patalas; R. A. Bodaly and C. P. Archibald. GLACIATION AND THE PHYSICAL, CHEMICAL AND BIOLOGICAL LIMNOLOGY OF YUKON LAKES. *Can. Tech. Rep. Fish. Aquatic Sci.* No. 966. vi + 37p. May 1981. In English with French summ. SFA 27(2)
[Dep. Fish. Oceans, Winnipeg, MB R3T 2N6, Canada]

82-000576 Sartoris, J. J.; J. F. LaBounty; S. G. Campbell and J. R. Boehmke. LIMNOLOGY OF THE UPPER NORTH PLATTE RESERVOIR SYSTEM, WYOMING. *U.S. Dep. Interior Bur. Reclam.* REC-ERC-81-10. v + 129p. July 1981. SFA 27(2)
[Bur. Reclam., Appl. Sci. Br., Div. Res., Eng. Res. Cent., Denver, CO]

82-000577 Thompson, R. GENERAL CHARACTERISTICS OF SPRINGS IN NEVADA AND UTAH. *Proc. Desert Fishes Counc.* 12:49-52. 1980(1981). SFA 27(2)
[HDR Sci., 804 Anacapa St., Santa Barbara, CA 93101]

82-000578 Youger, J. D. RESULTS OF A TROPHIC CLASSIFICATION OF OHIO LAKES. *Ohio J. Sci.* 82(2):90. 1982. Abstract only. SFA 27(2)
[Ohio Environ. Prot. Agency, 361 E. Broad St., Columbus 43215]

## CHEMICAL LIMNOLOGY AND OCEANOGRAPHY

82-000579 Tarapchak, S. J.; S. M. Bigelow and C. Rubitschun. OVERESTIMATION OF ORTHOPHOSPHORUS CONCENTRATIONS IN SURFACE WATERS OF SOUTHERN LAKE MICHIGAN: EFFECTS OF ACID AND AMMONIUM MOLYBDATE. *Can. J. Fish. Aquatic Sci.* 39(2):296-304. Feb. 1982. In English with French summ. SFA 27(2)
[NMFS, 2200 Washtenaw Ave., Ann Arbor, MI 48104]

## BENTHOS

82-000580 Cooper, S. D. and C. R. Goldman. ENVIRONMENTAL FACTORS AFFECTING PREDATION RATES OF *MYSIS RELICTA*. *Can. J. Fish. Aquatic Sci.* 39(1):203-208. Jan. 1982. In English with French summ. SFA 27(2)
[Dep. Biol. Sci., Univ. Calif., Santa Barbara 93106]

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82-000581 Hale, M. M. and D. R. Bayne. EFFECTS OF WATER LEVEL FLUCTUATIONS ON THE LITTORAL MACROINVERTEBRATES OF WEST POINT RESERVOIR. *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:175-180. 1980[1981]. SFA 27(2)
[Fish. Res. Lab., Fla. Game Fresh Water Fish Comm., Eustis 32726]

82-000582 Landye, J. J. THE CONSERVATION OF MOLLUSKS IN MEXICO AND THE U.S.A. *Proc. Desert Fishes Counc.* 12:98-99. 1980(1981). In English and Spanish. Abstract only. SFA 27(2)
[BIO-GEO Southwest, Inc., 3465 N. Jamison Blvd., Flagstaff, AZ 86001]

82-000583 Mills, E. L.; K. Pittman and B. Munroe. EFFECT OF PRESERVATION ON THE WEIGHT OF MARINE BENTHIC INVERTEBRATES. *Can. J. Fish. Aquatic Sci.* 39(1):221-224. Jan. 1982. In English with French summ. SFA 27(2)
[Dep. Oceanogr., Dalhousie Univ., Halifax, NS B3H 4J1, Canada]

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82-000584 Harper, D. M. and A. J. D. Ferguson. ZOOPLANKTON AND THEIR RELATIONSHIPS WITH WATER QUALITY AND FISHERIES. *Hydrobiologia* 88(1-2):135-145. 26 Mar. 1982. SFA 27(2)
[Dep. Adult Educ., Univ. Leicester, Leicester, England]

82-000585 Kulka, D. W.; S. Corey and T. D. Iles. COMMUNITY STRUCTURE AND BIOMASS OF EUPHAUSIIDS IN THE BAY OF FUNDY. *Can. J. Fish. Aquatic Sci.* 39(2):326-334. Feb. 1982. In English with French summ. SFA 27(2)
[Dep. Fish. Oceans, P.O. Box 5667, St. John's, NF A1C 5X1, Canada]

82-000586 Nero, R. W. and I. J. Davies. COMPARISON OF TWO SAMPLING METHODS FOR ESTIMATING THE ABUNDANCE AND DISTRIBUTION OF *MYSIS RELICTA*. *Can. J. Fish. Aquatic Sci.* 39(2):349-355. Feb. 1982. In English with French summ. SFA 27(2)
[Dep. Zool., Univ. Toronto, Erindale Campus, Mississauga, ON L5L 1C6, Canada]

82-000587 Platt, T., (ed.). PHYSIOLOGICAL BASES OF PHYTOPLANKTON ECOLOGY. *Can. Bull. Fish. Aquatic Sci.* 210. ix + 346p. 1981. In English with French summ. SFA 27(2)
[Dep. Fish. Oceans, Bedford Inst. Oceanogr., Dartmouth, NS B24 4A2, Canada] A collection of papers.--RS

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82-000588 Harrison, W. G.; T. Platt and B. Irwin. PRIMARY PRODUCTION AND NUTRIENT ASSIMILATION BY NATURAL PHYTOPLANKTON POPULATIONS OF THE EASTERN CANADIAN ARCTIC. *Can. J. Fish. Aquatic Sci.* 39(2):335-345. Feb. 1982. In English with French summ. SFA 27(2)
[Dep. Fish. Oceans, Bedford Inst. Oceanogr., Dartmouth, NS B2Y 4A2, Canada]

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82-000589 Adams, P. B. and C. J. Ryan. MORPHOLOGY AND GROWTH OF A PUGHEADED BROWN ROCKFISH, *SEBASTES AURICULATUS*. *Calif. Fish Game* 68(1):54-57. Jan. 1982. SFA 27(2)
[NMFS, 3150 Paradise Dr., Tiburon, CA 94920]

82-000590 Andreucci, R. D.; H. A. Britski and J. Carneiro. STRUCTURE AND EVOLUTION OF TETRAODONTOID TEETH: AN AUTORADIOGRAPHIC STUDY (PISCES, TETRAODONTIFORMES). *J. Morphol.* 171(3):283-292. Mar. 1982. SFA 27(2)
[Dep. Morphol., Fac. Odontol. São José dos Campos (UNESP), SP, Brazil]

82-000591 Badcock, J. THE SIGNIFICANCE OF MERISTIC VARIATION IN *BENTHOSEMA GLACIALE* (PISCES, MYCTOPHOIDEI) AND OF THE SPECIES DISTRIBUTION OFF NORTHWEST AFRICA. *Deep-Sea Res. A Oceanogr. Res. Pap.* 28(12):1477-1491. Dec. 1981. SFA 27(2)
[Inst. Oceanogr. Sci., Wormley, Godalning, Surrey GU8 5UB, England]

82-000592 Berra, T. M. and R.-J. Au. INCIDENCE OF TERATOLOGICAL FISHES FROM CEDAR FORK CREEK, OHIO. *Ohio J. Sci.* 81(5-6):225-229. Sept.-Nov. 1981. SFA 27(2)
[Dep. Zool., Ohio State Univ., Mansfield 44906]

82-000593 Best, A. C. G. and J. A. B. Gray. NERVE FIBRE AND RECEPTOR COUNTS IN THE SPRAT UTRICULUS AND LATERAL LINE. *J. Mar. Biol. Assoc. U.K.* 62(1):201-213. Feb. 1982. SFA 27(2)
[Mar. Biol. Assoc., Citadel Hill, Plymouth, PL1 2PB, England]

82-000594 Bhattacharyya, T. K.; D. G. Butler and J. H. Youson. ULTRASTRUCTURE OF THE CORPUSCLES OF STANNIUS OF THE GARPIKE (*LEPISOSTEUS PLATYRHYNCHUS*). *Gen. Comp. Endocrinol.* 46(1):29-41. Jan. 1982. SFA 27(2)
[Dep. Zool., Univ. Toronto, 25 Harbord St., Toronto, ON M5S 1A1, Canada]

82-000595 Bowne, P. S. SWIMBLADDER DEPOSITS: OCCURRENCE AND MORPHOLOGY IN MACROURIDAE, MORIDAE AND OPHIDIIFORMES. *Copeia* 1982(1):205-208. 23 Feb. 1982. SFA 27(2)
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MORPHOLOGY (CONTINUED)

82-000605 CONTINUED spawnings. Second growth phase oocytes grow synchronously. Oocytes of 'Yolk vesicle stage I' are suggested to be the first stage of second growth phase which lasts for somewhat less than one year, and ends with spawning.

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[Dep. Zool., South. Ill. Univ., Carbondale 62901] Breeding tubercles in *Ictiobus cyprinellus* are reported for the first time. Tubercles were found on males from Rend Lake, Franklin Co., Illinois, and were distributed over the head, predorsal area, midlateral body, caudal peduncle and fin rays. The tubercles consisted of keratinized caps over masses of hypertrophied, hyperplastic epidermal cells and resembled those of *Moxostoma erythrurum*. *Ictiobus cyprinellus* tubercles are probably used as contact organs or to stimulate females during spawning.

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[1020 Custer Ave., Ogden, UT 84404]

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82-000647 Cech, J. J., Jr. and D. E. Wohlschlag. SEASONAL PATTERNS OF RESPIRATION, GILL VENTILATION, AND HEMATOLOGICAL CHARACTERISTICS IN THE STRIPED MULLET, *MUGIL CEPHALUS* L. *Bull. Mar. Sci.* 32(1):130-138. Jan. 1982. SFA 27(2)
[Wildl. Fish. Biol., Univ. Calif., Davis 95616] The striped mullet, *Mugil cephalus*, endures pronounced diurnal and seasonal temperature changes in

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82-000647 CONTINUED the shallow bay system of the Texas coast. The mullet responds to its temperature-induced changes in metabolic oxygen demand with a pattern of respiratory, ventilatory, and hematological adjustments. These variables were measured at 14.5° and 28.5°C during each season to separate seasonal from short-term responses. In van Dam-type respirometers, oxygen consumption rates remained at essentially constant levels at each temperature through the year ($\bar{x}$ = 42.84 ml $O_2$/kg/h at 14.5°C and 141.83 ml $O_2$/kg/h at 28.5°C). Gill ventilatory flows, frequencies and stroke volumes also reamined seasonally constant at each temperature. Seasonal differences at each temperature regime were most evident in the blood characteristics of hemoglobin concentration and hematocrit. While both juvenile and adult fish display increases in response to the energy demands imposed by warmed environments, seasonal peaks of hemoglobin and hematocrit (autumn Hb = 8.24g%, Hc = 32%) occurred as waters cooled when the adults migrated to the Gulf of Mexico for spawning. This pattern should enhance the ecological fitness of a spawning adult striped mullet by increasing its capacity for aerobic swimming performance during the migration, thereby decreasing mortality by predation.

82-000648 Charlon, N. and J. M. Blanc. ETUDE DES CIVELLES D'*ANGUILLA ANGUILLA* L. DANS LA RÉGION DU BASSIN DE L'ADOUR. 1. CARACTÉRISTIQUES BIOMÉTRIQUES DE LONGUEUR ET DE POIDS EN FONCTION DE LA PIGMENTATION. [A STUDY OF THE ELVERS (*ANGUILLA ANGUILLA* L.) IN THE ADOUR BASIN AREA. 1. LENGTH AND WEIGHT BIOMETRICAL CHARACTERISTICS IN FUNCTION OF PIGMENTATION.] *Arch. Hydrobiol.* 93(2):238-255. 1982. In French with English summ. SFA 27(2)
[Cent. Rech. Hydrobiol., B.P. 3, Saint-Pée-sur-Nivelle, 64310 Ascain, France] Two types of elver populations have been studied from October 1979 to August 1980 by periodical samplings along the seaside on one hand, and in the river on the other hand. The biometrical characteristics are given in function of the time of the year and of the stage of pigmentation. It appears that the decrease in length and weight in the course of time, regarded by some authors as a second metamorphosis, is only due to differences in biometrical characteristics of the successive populations arriving along the French coast all the year round.

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[Dep. Wildl. Fish Sci., Tex. A&M Univ., College Station 77843] Texas stocks of northern and Florida largemouth bass (*Micropterus salmoides salmoides* and *M. s. floridanus*) were compared for resistance to cold shock. The 45 advanced fingerlings of each subspecies had nearly identical rearing histories and were acclimated to a common temperature near 21 C. Laboratory tests were conducted at constant temperatures ranging from 5.3 to 13.5 C. Over all tests, more than twice as many Florida bass as northern bass died during the 7 days of observation. We estimated that the 96-h median tolerance limit was about 6C for northern bass and about 8.5C for the Florida bass. These findings are consistent with the hypothesis that Florida bass stocked outside their original range may suffer higher overwinter mortality, owing to lesser cold tolerance, than native northern bass.

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[Mar. Sci. Res. Lab., Memorial Univ. Newfoundland, St. John's, NF A1C 5S7, Canada]

82-000654 Dabrowski, K. PROTEOLYTIC ENZYME ACTIVITY DECLINE IN STARVING FISH ALEVINS AND LARVAE. *Environ. Biol. Fishes* 7(1):73-76. 15 Jan. 1982. SFA 27(2)
[Inst. Ichthyobiol. Fish., Acad. Agric. Technol., 10-957 Olsztyn-Kortowo, Poland] An experiment to identify the point of no return of fish alevins and larvae has been made using the proteolytic activity as an index. Larvae of *Coregonus pollan* and *Salmo gairdneri* were starved or fed with zooplankton as a control and proteolytic enzymes measured. The lowest value of the total proteolytic activity coincides with the point of no return expressed in degree-days based on survival trials.

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82-000656 Davie, P. S. CHANGES IN VASCULAR AND EXTRAVASCULAR VOLUMES OF EEL MUSCLE IN RESPONSE TO CATECHOLAMINES: THE FUNCTION OF THE CAUDAL LYMPHATIC HEART. *J. Exp. Biol.* 96:195-208. Feb. 1982. SFA 27(2)
[Dep. Physiol. Anat., Massey Univ., Palmerston North, New Zealand]

82-000657 Daxboeck, C. EFFECT OF CORONARY ARTERY ABLATION ON EXERCISE PERFORMANCE IN *SALMO GAIRDNERI*. *Can. J. Zool.* 60(3):375-381. Mar. 1982. In English with French summ. SFA 27(2)
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[Sch. Nat. Resour., Univ. Mich., Ann Arbor 48109] The metabolism of northern pike (*Esox lucius*) was determined by oxygen consumption and ration experiments to obtain data for an energy budget analysis. Metabolic measures of oxygen consumption were most reliable, and were described by the equations: $Rmet = 27.5\ Wt^{0.82}$ and 14°C and $Rmet = 1.6Wt^{0.97}$ at 2°C. In addition, conversion efficiency ($K_2 = 0.319 \pm 0.064$) and assimilation efficiency ($0.872 \pm 0.060$) were determined. Proximate composition of fish under various feeding regimes indicated that energy gain or depletion from the body was due to changes in amount of whole body tissue or body protein, rather than specific utilization or storage of lipid.

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[Stn. Mar. d'Endoume, rue Batterie des Lions, 13007 Marseille, France]

82-000662 Doneen, B. A. EFFECTS OF ADAPTATION TO SEA WATER, 170% SEA WATER AND TO FRESH WATER ON ACTIVITIES AND SUBCELLULAR DISTRIBUTION OF BRANCHIAL $NA^+$-$Ka^+$-ATPASE, LOW- AND HIGH AFFINITY $CA^{++}$-ATPASE, AND OUABAIN-INSENSITIVE ATPASE IN *GILLICHTHYS MIRABILIS*. *J. Comp. Physiol. B Biochem. Syst. Environ. Physiol.* 145(1):51-61. 1 Dec. 1981. SFA 27(2)
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[Grad. Sch. Oceanogr., Univ. R.I., Kingston 02881]

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[Inst. Nat. Rech. Agron., Lab. Physiol. Poissons, Campus de Beaulieu, 35042 Rennes Cedex, France]

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82-000672 Gray, R. H.; T. L. Page; M. G. Saroglia and P. Bronzi. COMPARATIVE TOLERANCE TO GAS SUPERSTURATED WATER OF CARP, *CYPRINUS CARPIO*, AND BLACK BULLHEAD, *ICTALURUS MELAS*, FROM THE U.S.A. AND ITALY. *J. Fish Biol.* 20(2):223-227. Feb. 1982. SFA 27(2)
[Battelle, Pac. Northwest Lab., Richland, WA 99352] Supersaturation of surface water with atmospheric gases may result from hydroelectric or thermoelectric power generation and adversely affect aquatic biota. Although the phenomenon has been extensively studied in the northwestern United States, its occurrence is less well documented in Europe. We evaluated the tolerance of carp, *Cyprinus carpio*, and black bullhead, *Ictalurus melas*, from Italy to gas supersaturated water and compared our results to data reported in the literature for the same species from the Columbia River, U.S.A. Carp and black bullhead from Italy were more susceptible to gas supersaturation than those from the Columbia River. This may reflect greater adaptation of Columbia River fish due to their historical exposure to supersaturated water resulting from numberous hydroelectric dams.

82-000673 Gruber, S. H. ROLE OF THE LEMON SHARK, *NEGAPRION BREVIROSTRIS* (POEY) AS A PREDATOR IN THE TROPICAL MARINE ENVIRONMENT: A MULTIDISCIPLINARY STUDY. *Fla. Sci.* 45(1):46-75. 1982. SFA 27(2)
[Rosentiel Sch. Mar. Atmos. Sci., Univ. Miami, 4600 Richenbacker Causeway, Miami, FL 33149] Sharks are numerically important members of many marine communities, yet little is known of their role in these ecosystems. Recent technical developments in laboratory and field have facilitated investigation of the autecology of the lemon shark *Negaprion brevirostris* (Poey). This littoral shark is abundant, lives well in captivity and is ideally suited for

PHYSIOLOGY (CONTINUED)

82-000673 CONTINUED investigation. Over the past 24 mo we have marked and released 984 young sharks during a study of population dynamics. Each was injected with tetracycline for age validation. We tracked individual sharks for hundreds of km via ultrasonic telemetry thus determining activity rates, movements, home ranges and diel periods. We evaluated blood gas parameters, food intake, digestion, growth, resting and routine metabolism in the laboratory. These data provide estimates of the energy budget of the lemon shark and form a basis for understanding the flow of energy from environment to shark. Our tentative conclusion is that an adult lemon shark must remove nearly 1500 g of fish daily (1.6 x $10^6$ calories) to account for its vital activities.

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[Dr. W. Hanke: Dep. Zool. II, Kaiserstr. 12, Univesity, D-7500 Karlsruhe, West Germany]

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[Dep. Zool., Nelson Biol. Lab., P.O. Box 1059-Busch Campus, Piscataway, NJ 08854]

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[Dr. W. Hanke: Dep. Zool. II, Kaiserstr. 12, Univesity, D-7500 Karlsruhe, West Gemany]

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82-000680 Hickey, C. R., Jr. COMPARATIVE HEMATOLOGY OF WILD AND CAPTIVE CUNNERS. *Trans. Am. Fish. Soc.* 111(2):242-249. Mar. 1982. SFA 27(2)
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82-000681 Hickey, G. M. WOUND HEALING IN FISH LARVAE. *J. Exp. Mar. Biol. Ecol.* 57(2-3):149-168. 22 Jan. 1982. SFA 27(2)
[Dunstaffnage Mar. Lab., Oban, Argyll, Scotland] Healing of skin lesions

PHYSIOLOGY (CONTINUED)

82-000681 CONTINUED has been investigated in herring, *Clupea harengus* L., plaice, *Pleuronectes platessa* L., and salmon, *Salmon salar* L., larvae. Healing was observed in vivo and by histology, the main response being as mass migration of epidermal cells from the periphery of the lesion. Wound areas of 0.1-7 $mm^2$ closed in 4-12 h, the mean rates of cell migration being 60-110 µm/h at 10-11°C. The rate of migration doubled with a 10°C rise in temperature. Normal skin structure was restored with regeneration of a new basement membrane and dermis within three weeks. Older stage larvae showed an inflammatory response similar to adult fish.

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82-000683 Hilton, J. W.; P. V. Hodson and S. J. Slinger. ABSORPTION, DISTRIBUTION, HALF-LIFE AND POSSIBLE ROUTES OF ELIMINATION OF DIETARY SELENIUM IN JUVENILE RAINBOW TROUT (*SALMO GAIRDNERI*). *Comp. Biochem. Physiol. C Comp. Pharmacol.* 71(1):49-55. 1982. SFA 27(2)
[Dep. Nutr., Coll. Biol. Sci., Univ. Guelph, Guelph, ON N1G 2W1, Canada]

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[Dep. Zool., Univ. British Columbia, Vancouver, BC V6T 2A9, Canada]

82-000685 Hofer, R.; H. Forstner and R. Rettenwander. DURATION OF GUT PASSAGE AND ITS DEPENDENCE ON TEMPERATURE AND FOOD CONSUMPTION IN ROACH, *RUTILUS RUTILUS* L: LABORATORY AND FIELD EXPERIMENTS. *J. Fish Biol.* 20(3):289-299. Mar. 1982. SFA 27(2)
[Inst. Zoophysiol., Univ. Innsbruck, A-6020 Innsbruck, Austria] A laboratory method is described by means of which gut passage time as a function of temperature, diet and consumption rate is investigated in roach, an omnivorous cyprinid. Rates of food passage are accelerated by increasing temperature and food consumption. Equations for the regressions between gut passage time and consumption rate at four temperatures are given. Animal food causes a delay in gut passage time. In adult roach (30-100g body weight) gut passage time was found to be independent of size. A field method was also developed which allows the direct estimation of gut passage time and consumption rate in natural fish populations. The results of experiments with this field method agree with those of laboratory experiments.

82-000686 Holmgren, S.; C. Vaillant and R. Dimaline. VIP-, SUBSTANCE P-, GASTRIN/CCK-, BOMBESIN-, SOMATOSTATIN- AND GLUCAGON-LIKE IMMUNOREACTIVITIES IN THE GUT OF THE RAINBOW TROUT, *SALMO GAIRDNERI*. *Cell Tissue Res.* 223(1):141-153. Feb. 1982. SFA 27(2)
[Dep. Zool., Univ. Göteborg, Göteborg, Sweden]

82-000687 Houston, A. H. and K. M. Mearow. BRANCHIAL AND RENAL ($Na^+/K^+$) ATPASE AND CARBONIC ANHYDRASE ACTIVITIES IN A EURYTHERMAL FRESHWATER TELEOST, *CARASSIUS AURATUS* L. *Comp. Biochem. Physiol. A Comp. Physiol.* 71(2):175-180. 1982. SFA 27(2)
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82-000691 Ikeda, Y. and H. Ozaki. [CHANGES OF VARIOUS SERUM CONSTITUENT LEVELS BY HEMOLYSIS IN CARP (THE STUDIES ON HEMOCHEMICAL HEALTH ASSESSMENT IN FISH-II).] *Bull. Jpn. Soc. Sci. Fish.* 47(12):1647. Dec. 1981. In Japanese. SFA 27(2)
[Tokyo Univ. Fish., 5-7, Konan-4, Minato, Tokyo 108, Japan]

82-000692 Ikeda, Y. and H. Ozaki. [THE EXAMINATION OF TAIL PEDUNCLE SEVERING BLOOD SAMPLING METHOD FROM ASPECT OF OBSERVED SERUM CONSTITUENT LEVELS IN CARP.] *Bull. Jpn. Soc. Sci. Fish.* 47(11):1477-1453. Nov. 1981. In Japanese with English summ. SFA 27(2)
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82-000693 Ince, B. W. PLASMA CLEARANCE KINETICS OF UNLABELLED BOVINE INSULIN IN RAINBOW TROUT (*SALMO GAIRDNERI*). *Gen. Comp. Endocrinol.* 46(4):463-472. Apr. 1982. SFA 27(2)
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82-000694 Jones, P. L. and B. D. Sidell. METABOLIC RESPONSES OF STRIPED BASS (*MORONE SAXATILIS*) TO TEMPERATURE ACCLIMATION. II. ALTERATIONS IN METABOLIC CARBON SOURCES AND DISTRIBUTIONS OF FIBER TYPES IN LOCOMOTORY MUSCLE. *J. Exp. Zool.* 219(2):163-171. 1 Feb. 1982. SFA 27(2)
[B.D. Sidell: Dep. Zool., Migratory Fish Res. Inst., Univ. Me., Orono 04469]

82-000695 Kime, D. E. and G. V. Callard. FORMATION OF 15α-HYDROXYLATED ANDROGENS BY THE TESTIS AND OTHER TISSUES OF THE SEA LAMPREY, *PETROMYZON MARINUS*, IN VITRO. *Gen. Comp. Endocrinol.* 46(2):267-270. Feb. 1982. SFA 27(2)
[Dep. Zool., The University, Sheffield S10 2TN, England]

82-000696 Kitajima, C.; Y. Tsukashima; S. Fujita; T. Watanabe and Y. Yone. [RELATIONSHIP BETWEEN UNINFLATED SWIM BLADDERS AND LORDOITIC DEFORMITY IN HATCHERY-REARED RED SEA BREAM *PAGRUS MAJOR*.] *Bull. Jpn. Soc. Sci. Fish.* 47(10):1289-1294. Oct. 1981. In Japanese with English summ. SFA 27(2)
[Aquacult. Res. Lab., Nagasaki Pref. Inst. Fish., Nomozaki, Nagasaki 851-05, Japan] The lordosis frequently observed in hatchery-reared red sea

## PHYSIOLOGY (CONTINUED)

82-000696 CONTINUED bream, a big problem in the seed production in Japan, is known to be induced in the fish with uninflated swim bladders. Rearing experiments were conducted to determine whether the abnormally developed swim bladders were due to failure in gulping air at the water surface. One tank was sealed with a layer of liquid paraffin and the other with open surface served as a control. Over 90% of the larvae had normal swim bladders at around 7th day after initial feeding (4.2 mm in total length) in the control, whereas none was inflated in the sealed tank. On the other hand, the lordosis began to appear at around 40th day after hatching in the fish with uninflated swim bladder and more than 90% of the fish showed characteristic lordosis at the end of the feeding trial of 120 days. Thus, it has been shown that gulping air at the water surface is essential for the initial swim bladder inflation and that the uniflation is closely related to the development of lordotic deformity. The relationship between the nutritional quality of rotifers or rearing conditions such as aeration and swim bladder inflation is also discussed.

82-000697 Klinger, S. A.; J. J. Magnuson and G. W. Gallepp. SURVIVAL MECHANISMS OF THE CENTRAL MUDMINNOW (*UMBRA LIMI*), FATHEAD MINNOW (*PIMEPHALES PROMELAS*) AND BROOK STICKLEBACK (*CULAEA INCONSTANS*) FOR LOW OXYGEN IN WINTER. *Environ. Biol. Fishes* 7(2):113-120. 15 Mar. 1982. SFA 27(2)

[Lab. Limnol., Dep. Zool., Univ. Wis., Madison 53706] Three species (central mudminnow, fathead minnow and brook stickleback) survive when a northern Wisconsin lake becomes anoxic in winter. Some gas bubbles beneath the ice contained as much as 11% oxygen when the lake contained <0.30 mg $1^{-1}$ dissolved oxygen. Experiments conducted in the field determined that gas bubbles prolonged survival of all species, especially the mudminnow and stickleback. In the laboratory, brook sticklebacks exhibited the lowest and fathead minnows the highest routine metabolic rate corrected for weight. Rate of gill ventilation of all three increased from 20 to 70 beats per minute as oxygen levels declined from 4.0 to 0.25 mg $1^{-1}$. At low oxygen levels they moved to the upper one-third of the test tanks. Small size, low metabolic rate, tolerance of low oxygen conditions and reduced activity resulted in reduced demand for dissolved oxygen. Head shape, ventilation rate, vertical movement and utilization of high oxygen microzones also enhanced exploitation of low levels of dissolved oxygen. Central mudminnows used oxygen directly from gas bubbles found under the ice.

82-000698 Kramer, D. L. and M. McClure. AQUATIC SURFACE RESPIRATION, A WIDESPREAD ADAPTATION TO HYPOXIA IN TROPICAL FRESHWATER FISHES. *Environ. Biol. Fishes* 7(1):47-55. 15 Jan. 1982. SFA 27(2)

[Dep. Biol., McGill Univ., 1205 Ave. Docteur Penfield, Montreal, PQ H3A 1B1, Canada]

82-000699 Lanzing, W. J. R. and R. G. Wright. THE ULTRASTRUCTURE OF THE EYE OF THE MOSQUITOFISH *GAMBUSIA AFFINIS*. *Cell Tissue Res.* 223(2):431-443. 1982. SFA 27(2)

[Sch. Biol. Sci., Univ. Sydney, New South Wales, Australia]

82-000700 Lapkin, V. V.; A. M. Svirsky and V. K. Golovanov. [AGE DYNAMICS OF SELECTED AND LETHAL TEMPERATURES IN FISHES.] *Zool. Zh.* 60(12):1792-1801. 1981. In Russian with English summ. SFA 27(2)

[Inst. Biol. Inland Waters, USSR Acad. Sci., Borok, Yaroslavl Reg., USSR] The ultimate selected and ultimate upper lethal temperatures were studied in *Abramis brama*, *Rutilus rutilus* and *Perca fluviatilis* with respect to the age. On the basis of the data obtained and published elsewhere, a model of dynamics of the optimal (selected) temperatures and thermal tolerance of fishes during ontogenesis has been constructed. The zone of thermal tolerance

PHYSIOLOGY (CONTINUED)

82-000700 CONTINUED was shown to be minimal in the beginning of embryogenesis, attain the maximum during the period of fry development and narrow gradually down in adult fishes. The dynamics of optimal temperatures has a more complicated pattern. The application of theoretical concepts on the functioning of dynamic open systems for the description of thermal adaptive properties of fishes is discussed.

82-000701 Leatherland, J. F. ENVIRONMENTAL PHYSIOLOGY OF THE TELEOSTEAN THYROID GLAND: A REVIEW. *Environ. Biol. Fishes* 7(1):83-110. 15 Jan. 1982. SFA 27(2)
[Dep. Zool., Coll. Biol. Sci., Univ. Guelph, Guelph, ON N1G 2W1, Canada]

82-000702 Levin, G. B. and J. G. Eales. EFFECT OF HYPOPHYSECTOMY ON THYROXINE DEIODINATION IN RAINBOW TROUT, *SALMO GAIRDNERI*. *Can. J. Zool.* 60(3):403-405. Mar. 1982. In English with French summ. SFA 27(2)
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82-000703 Matsumiya, M. and S. Otake. [THE INVESTIGATION OF DIAMINE OXIDASE-LIKE ENZYMES IN THE VARIOUS ORGANS OF FISHES.] *Bull. Jpn. Soc. Sci. Fish.* 47(12):1599-1604. Dec. 1981. In Japanese with English summ. SFA 27(2)
[Coll. Agric. Vet. Med., Nihon Univ., 34-1, Shimouma-3, Setagaya, Tokyo 154, Japan]

82-000704 McNulty, J. A. THE EFFECTS OF CONSTANT LIGHT AND CONSTANT DARKNESS ON THE PINEAL ORGAN OF THE GOLDFISH, *CARASSIUS AURATUS*. *J. Exp. Zool.* 219(1):29-37. 10 Jan. 1982. SFA 27(2)
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[Dep. Biol., Univ. Calif., Los Angeles 90024]

## GENETICS, VARIATION STUDIES AND HYBRIDIZATION (CONTINUED)

82-000766 Cashon, R. E. THE MALATE DEHYDROGENASE ISOZYMES AND ALLOZYMES OF *FUNDULUS HETEROCLITUS*. *Ph.D. dissertation, Johns Hopkins Univ.* 231p. 1982. From Diss. Abstr. Int. B Sci. Eng. 42(9):3538. Mar. 1982. SFA 27(2)

82-000767 Casselman, J. M.; J. J. Collins; E. J. Crossman; P. E. Ihssen and G. R. Spangler. LAKE WHITEFISH (*COREGONUS CLUPEAFORMIS*) STOCKS OF THE ONTARIO WATERS OF LAKE HURON. *Can. J. Fish. Aquatic Sci.* 38(12):1772-1789. Dec. 1981. In English with French summ. SFA 27(2)
[Ontario Minist. Nat. Resour., Res. Sect., Fish. Br., Maple, ON L0J 1E0, Canada]

82-000768 Colby, P. J. and S. J. Nepszy. VARIATION AMONG STOCKS OF WALLEYE (*STIZOSTEDION VITREUM VITREUM*): MANAGEMENT IMPLICATIONS. *Can. J. Fish. Aquatic Sci.* 38(12):1814-1831. Dec. 1981. In English with French summ. SFA 27(2)
[Ontario Minist. Nat. Resour., P.O. Box 5000, Thunder Bay, ON P7C 5G6, Canada]

82-000769 Dehring, T. R.; A. F. Brown; C. H. Daughtery and S. R. Phelps. SURVEY OF THE GENETIC VARIATION AMONG EASTERN LAKE SUPERIOR LAKE TROUT (*SALVELINUS NAMAYCUSH*). *Can. J. Fish. Aquatic Sci.* 38(12):1728-1746. Dec. 1981. In English with French summ. SFA 27(2)
[Dep. Biol., North. Mich. Univ., Marquette 49855]

82-000770 Drenner, R. W. and F. B. Cross. A NATURAL HYBRID FISH, *PERCINA MACULATA* X *P. CAPRODES*, FROM KANSAS. *Trans. Kans. Acad. Sci.* 84:61-62. 1981. SFA 27(2)
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[Dep. Biol. Sci., Fla. State Univ., Tallahassee 32306]

82-000772 Ihssen, P. E.; H. E. Booke; J. M. Casselman; J. M. McGlade; N. R. Payne and F. M. Utter. STOCK IDENTIFICATION: MATERIALS AND METHODS. *Can. J. Fish. Aquatic Sci.* 38(12):1838-1855. Dec. 1981. In English with French summ. SFA 27(2)
[Ontario Minist. Nat., Resour., Res. Sect., Fish. Br., Maple, ON L0J 1E0, Canada]

82-000773 Kazákov, R. V. and S. A. Ilyenkova. [IDENTIFICATION OF RECIPROCAL HYBRIDS OF THE ATLANTIC SALMON AND SEA TROUT BY THE VARIABILITY OF THE WEIGHT OF OVULATED EGGS.] *Genetika* 18(1):154-160. 1982. In Russian with English summ. SFA 27(2)
[State Res. Inst. Lake River Fish., Leningrad, USSR] A sample of salmons, whose eggs were obtained for Narva hatchery was studied. Hybrid fish has been found to be highly variable concerning the weight of ovulated eggs ($V$=30-40%, max/min=4-5), as compared with the parental species ($V$=5-6%, max/min=1.2-1.4). The level of variability in the weight of ovulated eggs is suggested as a criterion for identification of hybrid females which cannot be distinguished from the Atlantic salmon and sea trout by their appearance with a view to cull them.

82-000774 Khuda-Bukhsh, A. R. KARYOMOPHOLOGY OF TWO SPECIES OF *TOR* (PISCES; CYPRINIDAE) WITH A HIGH NUMBER OF CHROMOSOMES. *Experientia (Basel)* 38(1):82-83. 15 Jan. 1982. SFA 27(2)

GENETICS, VARIATION STUDIES AND HYBRIDIZATION (CONTINUED)

82-000774 CONTINUED
[Dep. Zool., Univ. Kalyani, Kalyani-741235, India] The karyotypes of *Tor khudree* and *Tor tor*, occurring in the Himalayan streams in India, are described. As reported earlier for *T. putitora*, the diploid complements in these 2 congeneric species also comprise 100 chromosomes. The modal number being 2n=50 in this family, *Tor* appears to be of tetraploid origin.

82-000775 Krueger, C. C. and G. R. Spangler. GENETIC IDENTIFICATION OF SEA LAMPREY (*PETROMYZON MARINUS*) POPULATIONS FROM THE LAKE SUPERIOR BASIN. *Can. J. Fish. Aquatic Sci.* 38(12):1832-1837. Dec. 1981. In English with French summ. SFA 27(2)
[Wis. Dep. Nat. Resour., 101 South Webster St., GEF II, Box 7921, Madison 53707]

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[Inst. Anim. Resour. Ecol., Univ. British Columbia, Vancouver, BC V6T 1W5, Canada]

82-000777 Leary, R. and H. E. Booke. GENETIC STOCK ANALYSIS OF YELLOW PERCH FROM GREEN BAY AND LAKE MICHIGAN. *Trans. Am. Fish. Soc.* 111(1):52-57. Jan. 1982. SFA 27(2)
[H.E. Booke: Mass. Coop. Fish. Res. Unit, Univ. Mass., Holdsworth Hall, Amherst 01003]

82-000778 Philipp, D. P.; W. F. Childers and G. S. Whitt. MANAGEMENT IMPLICATIONS FOR DIFFERENT GENETIC STOCKS OF LARGEMOUTH BASS (*MICROPTERUS SALMOIDES*) IN THE UNITED STATES. *Can. J. Fish. Aquatic Sci.* 38(12):1715-1723. Dec. 1981. In English with French summ. SFA 27(2)
[Aquatic Biol. Sect., Ill Nat. Hist. Surv., Urbana 61801]

82-000779 Ryder, R. A.; S. R. Kerr; W. W. Taylor and P. A. Larkin. COMMUNITY CONSEQUENCES OF FISH STOCK DIVERSITY. *Can. J. Fish. Aquatic Sci.* 38(12):1856-1866. Dec. 1981. In English with French summ. SFA 27(2)
[Ontario Minist. Nat. Resour., Box 2089, Thunder Bay, ON P7B 5E7, Canada]

82-000780 Ryman, N. and G. Ståhl. GENETIC PERSPECTIVES OF THE IDENTIFICATION AND CONSERVATION OF SCANDINAVIAN STOCKS OF FISH. *Can. J. Fish. Aquatic Sci.* 38(12):1562-1575. Dec. 1981. In English with French summ. SFA 27(2)
[Dep. Genet., Univ. Stockholm, Box 6801, S-113 86, Stockholm, Sweden]

82-000781 Swinney, G. N. and T. F. Coles. DESCRIPTION OF TWO HYBRIDS INVOLVING SILVER BREAM, *BLICCA BJOERKNA* (L.), FROM BRITISH WATERS. *J. Fish Biol.* 20(2):121-129. Feb. 1982. SFA 27(2)
[R. Scott. Mus., Chambers St., Edinburgh, Scotland]

82-000782 Thompson, D.; C. E. Purdom and B. W. Jones. GENETIC ANALYSIS OF SPONTANEOUS GYNOGENETIC DIPLOIDS IN THE PLAICE *PLEURONECTES PLATESSA*. *Heredity* 47(2):269-274. Oct. 1981. SFA 27(2)

## GENETICS, VARIATION STUDIES AND HYBRIDIZATION (CONTINUED)

82-000782 CONTINUED
[Minist. Agric. Fish. Food, Fish. Lab., Lowestoff, Suffolk NR33 0HT, England]

82-000783 Thorpe, J. E. and K. A. Mitchell. STOCKS OF ATLANTIC SALMON (*SALMO SALAR*) IN BRITAIN AND IRELAND: DISCRETENESS, AND CURRENT MANAGEMENT. *Can. J. Fish. Aquatic Sci.* 38(12):1576-1590. Dec. 1981. In English with French summ. SFA 27(2)
[Freshwater Fish. Lab., Pitlochry, Perthshire PH16 5LB, Scotland]

82-000784 Thorpe, J. E.; J. F. Koonce; D. Borgeson; B. Henderson; A. Lamsa; P. S. Maitland; M. A. Ross; R. C. Simon and C. Walters. ASSESSING AND MANAGING MAN'S IMPACT ON FISH GENETIC RESOURCES. *Can. J. Fish. Aquatic Sci.* 38(12):1899-1907. Dec. 1981. In English with French summ. SFA 27(2)
[Freshwater Fish. Lab., Pitlochry PH16 5LB, Scotland]

82-000785 Todd, T. N. ALLELIC VARIABILITY IN SPECIES AND STOCKS OF LAKE SUPERIOR CISCOES (COREGONINAE). *Can. J. Fish. Aquatic Sci.* 38(12):1808-1813. Dec. 1981. In English with French summ. SFA 27(2)
[U.S. FWS, Great Lakes Fish. Lab., Ann Arbor, MI 48105]

82-000786 Wallace, R. K., Jr. and J. S. Ramsey. A NEW CYPRINID HYBRID, *NOTROPIS LUTRENSIS* X *N. CALLITAENIA*, FROM THE APALACHICOLA DRAINAGE IN ALABAMA. *Copeia* 1982(1):214-217. 23 Feb. 1982. SFA 27(2)
[Ala. Coop. Fish. Res. Unit, Auburn Univ., Auburn, AL 36849]

82-000787 Whitmore, D. H. and W. Butler. INTERSPECIFIC HYBRIDIZATION OF SMALLMOUTH AND GUADALUPE BASS (*MICROPTERUS*): EVIDENCE BASED ON BIOCHEMICAL GENETIC AND MORPHOLOGICAL ANALYSES. *Southwest. Nat.* 27(1):99-106. 19 Feb. 1982. SFA 27(2)
[Dep. Biol., Univ. Tex., Arlington 76019] A rare incidence of natural interspecific hybridization has occurred in south-central Texas as a result of secondary contact between two allopatrically evolved species, smallmouth bass (*Micropterus dolomieui*) and Guadalupe bass (*M. treculi*). Hybridization was initiated by the stocking of smallmouth bass into the habitat of the endemic Guadalupe bass. The extent of hybridization and genetic introgression has been analyzed using a meristic index and diagnostic allozyme loci. Because hybridization is a relatively recent event, little evidence of genetic introgression was found. However, the possiblity of future introgression remains as a threat to the genetic integrity of the Guadalupe bass population.

82-000788 Williams, J. G. ELECTROPHORETIC VARIATION AMONG NINE SPECIES OF THE GENUS *CYPRINODON* (CYPRINODONTIDAE). *Ph.D. dissertation, Univ. Tex.* 158p. 1981. From Diss. Abstr. Int. B Sci. Eng. 42(7):2738. Jan. 1982. SFA 27(2)

82-000789 Wolters, W. R.; C. L. Chrisman and G. S. Libey. ERYTHROCYTE NUCLEAR MEASUREMENTS OF DIPLOID AND TRIPLOID CHANNEL CATFISH, *ICTALURUS PUNCTATUS* (RAFINESQUE). *J. Fish Biol.* 20(3):253-258. Mar. 1982. SFA 27(2)
[C.L. Chrisman: Dep. Anim. Sci., Purdue Univ., West Lafayette, IN 47907] Minor axis, major axis, and volume measurements of erythrocyte nuclei were compared by discriminant analysis to determine which variable best predicted ploidy levels. Predicted correct classification percentages for minor axis, volume, major axis, and all variables combined were 81.33, 86.21, 92.36 and

GENETICS, VARIATION STUDIES AND HYBRIDIZATION (CONTINUED)

82-000789 CONTINUED 92.65%, respectively. Minor axis and volume measurements were not as accurate in predicting ploidy levels because nuclear shape changed as the ploidy level changed from the diploid to triploid state. Mean major axis measurements alone classified 92.36% of the fish correctly with a discriminant level of 4.726µm.

82-000790 Wolters, W. R.; G. S. Libey and C. L. Chrisman. EFFECT OF TRIPLOIDY AND GROWTH AND GONAD DEVELOPMENT OF CHANNEL CATFISH. *Trans. Am. Fish. Soc.* 111(1);102-105. Jan. 1982. SFA 27(2)
[Dep. For. Nat. Resour., Purdue Univ., West Lafayette, IN 47907]

BEHAVIOR

82-000791 Barnett, C. THE CHEMOSENSORY RESPONSES OF YOUNG CICHLID FISH TO PARENTS AND PREDATORS. *Anim. Behav.* 30(1):35-42. Feb. 1982. SFA 27(2)
[Dep. Ethol., Univ. Bielefeld, P.O. Box 8640, 4800 Bielefeld, West Germany]

82-000792 Barton, M. COMPARATIVE DISTRIBUTION AND HABITAT PREFERENCES OF TWO SPECIES OF STICHAEOID FISHES IN YAQUINA BAY, OREGON. *J. Exp. Mar. Biol. Ecol.* 59(1):77-87. 12 Mar. 1982. SFA 27(2)
[Div. Sci. Math., Cent. Coll. Ky., Darrville 40422]

82-000793 Bentley, T. B. and M. L. Wiley. INTRA- AND INTER-SPECIFIC VARIATION IN BUOYANCY OF SOME ESTUARINE FISHES. *Environ. Biol. Fishes* 7(1):77-81. 15 Jan. 1982. SFA 27(2)
[Rosenstiel Sch. Mar. Atmos. Sci., Univ. Miami, 4600 Rickenbacker Causeway, Miami, FL 33149] Buoyancy was measured on eight species of estuarine fishes that were caught in 1m depth or less. Mean buoyancies of the physoclists *Fundulus heteroclitus, F. majalis, Cyprinodon variegatus* and *Leiostomus xanthurus* were similar and ranged from -6.5 to -18.00 kiloPascals below atmospheric pressure at sea level. *Menidia menidia* and *Pomatomus saltatrix* measured -36.6 and -46.1 kPa, respectively. Two physostomes, *Brevoortia tyrannus* and *Anchoa mitchilli*, measured +2.9 and -23.5 kPa, respectively, but the latter probably releases air when handled. The four most buoyant physoclist species live near the bottom in areas that receive daily tide induced currents. Negative buoyancy probably functions in them as in stream dwelling minnows and salmonids, which respond to currents by decreasing their buoyancy. The pronounced negative buoyancy of *M. menidia* may be a response to a preference for habitat where the currents are stronger. *P. saltatrix*, which can secrete gas into the swim bladder at the fastest rate known for any fish, combines high secretion (and resorption) rates with marked negative buoyancy. This enables it to quickly change depths over a wide vertical range, without overexpanding the swim bladder to cause positive buoyancy.

82-000794 Beulig, A. SOCIAL AND EXPERIENTIAL FACTORS IN THE RESPONSIVENESS OF SHARKS TO SOUND. *Fla. Sci.* 45(1):2-10. 1982. SFA 27(2)
[Div. Nat. Sci., New Coll. Univ. South Fla., Sarasota 33580] The responses to low-frequency, irregularly-pulsed sounds of juvenile lemon sharks (*Negaprion brevirostris*) that were born in captivity and deprived of normal experience were measured. These sounds were produced by a mechanical device oscillating a transparent plastic flipper at a frequency of 12.5 Hz. The sounds were known to attract juvenile sharks that were captured in the field but experientially-deprived sharks were not attracted to these sounds

## BEHAVIOR (CONTINUED)

82-000794 CONTINUED in initial tests. The sharks were then provided with opportunities to capture living prey and to experience auditory stimulation associated with wounded, struggling fish. These experiences were not sufficient to overcome the possible inhibitory effect on responsiveness of social isolation during testing. To verify the existence of a social factor the sharks were then tested in groups of three. Their approach-response level indicated attraction and compared favorably with juvenile sharks that had species-typical feeding and rearing experiences. Due to the confounding of social conditions during testing with experience in the present work it is not possible to isolate the roles of experiential and social factors in responsiveness to sounds. Suggestions for further research are made to resolve these issues.

82-000795 Brett, B. L. H. GENETICS AND BEHAVIOR OF SYMPATRIC SPECIES OF MOLLIES (PISCES: POECILIIDAE: *POECILIA*) IN MIDDLE AMERICA. *Ph.D. dissertation, Univ. Mich.* 124p. 1981. From Diss. Abstr. Int. B Sci. Eng. 42(9):3600. Mar. 1982. SFA 27(2)

82-000796 Brett, B. L. H. and D. J. Grosse. A REPRODUCTIVE PHEROMONE IN THE MEXICAN POECILIID FISH *POECILIA CHICA*. *Copeia* 1982(1):219-223. 23 Feb. 1982. SFA 27(2)
[Dep. Biol., Univ. Rochester, Rochester, NY]

82-000797 Burgess, J. W. and E. Shaw. EFFECTS OF *ACOUSTICO-LATERALIS* DENERVATION IN A FACULTATIVE SCHOOLING FISH: A NEAREST-NEIGHBOR MATRIX ANALYSIS. *Behav. Neural Biol.* 33(4):488-497. Dec. 1981. SFA 27(2)
[Mental Retardation Res. Cent., 760 Westwood Blvd., UCLA Med. Sch., Los Angeles, CA 90024] Spacing responses in schools of golden shiner fish were measured before and after surgical section of the posterior lateral line (*acoustico-lateralis*) nerves. Test fish swam closer to their five nearest schoolmates after surgery and maintained less parallel orientation to their nearest neighbors. These findings indicate a significant role of lateral line input in the spacing responses of these facultative-schooling freshwater fish. Fish maintained nonrandom patterns of spacing toward their five nearest schoolmates before surgery, distinguished by closer distances, more parallel orientation, and greater avoidance of positions behind schoolmates than expected by chance. Analysis revealed that both school structure and behavioral changes after lateral line surgery resemble what is known of obligate-schooling marine fish species. Results are discussed in the context of lateral line function in fish spacing responses and the role of sensory input in fish schooling.

82-000798 Calhoun, S. W.; E. G. Zimmerman and T. L. Beitinger. STREAM REGULATION ALTERS ACUTE TEMPERATURE PREFERENDA OF RED SHINERS, *NOTROPIS LUTRENSIS*. *Can. J. Fish. Aquatic Sci.* 39(2):360-363. Feb. 1982. In English with French summ. SFA 27(2)
[Dep. Biol., Tex. A&M Univ., College Station 77843]

82-000799 Casterlin, M. E. and W. W. Reynolds. THERMOREGULATORY BEHAVIOR AND DIEL ACTIVITY OF YEARLING WINTER FLOUNDER, *PSEUDOPLEURONECTES AMERICANUS* (WALBAUM). *Environ. Biol. Fishes* 7(2):177-180. 15 Mar. 1982. SFA 27(2)
[Mar. Biol. Prog., Univ. New England, Biddeford, ME 04005] Sixteen yearling winter flounder, tested individually for 3-day periods in electronic shuttleboxes, voluntarily occupied an 8-27°C range of temperature, with a modal final thermal preferendum of 18.5°C (mean 18.7°C, median 19°C, midpoint 17.5°C, s.d. 1.9°C, $S_k$+0.33). The locomotor activity pattern of the

BEHAVIOR (CONTINUED)

82-000799 CONTINUED yearling fish in the laboratory was markedly nocturnal, with mean hourly nocturnal activity exceeding mean hourly diurnal activity by a factor of 3.4. Maximum activity occurred at 0300 EST, minimum activity at 1400 EST. While activity generally increased with temperature, a local activity minimum occurred at 18.7°C, coinciding with the 24-hour mean final thermal preferendum. Comparison of these laboratory data with previously published field data suggest that behavioral responses to temperature and light play significant roles in determining age- and size-specific differences in seasonal depth stratification and onshore-offshore distributions in this species.

82-000800 Clark, D. T. VISUAL RESPONSES IN DEVELOPING ZEBRAFISH (*BRACHYDANIO RERIO*). *Ph.D. dissertation, Univ. Oreg.* 149p. 1981. From Diss. Abstr. Int. B Sci. Eng. 42(8):3077. Feb. 1982. SFA 27(2)

82-000801 Clayton, D. A. and T. C. Vaughan. PENTAGONAL TERRITORIES OF THE MUDSKIPPER *BOLEOPHTHALMUS BODARTI* (PISCES: GOBIIDAE). *Copeia* 1982(1):232-234. 23 Feb. 1982. SFA 27(2)
[Dep. Zool., Kuwait Univ., P.O. Box 5969, Kuwait]

82-000802 Douglas, R. H. AN ENDOGENOUS CREPUSCULAR RHYTHM OF RAINBOW TROUT (*SALMO GAIRDNERI*) PHOTOMECHANICAL MOVEMENTS. *J. Exp. Biol.* 96:377-388. Feb. 1982. SFA 27(2)
[Univ. Ulm, Abt. Klin. Morphol., 79 Ulm (Donau), Neubau Oberer Eselberg, West Germany] The position of the epithelial pigment and cones in the retina of *Salmo gairdneri* was determined during extended periods of darkness in fish entrained to both artificial and natural light/dark cycles. An endogenous rhythm of such photomechanical movements, unique among species so far examined, was observed in both groups of fish, with two peaks of light adaptation coincident with dawn and dusk. It is suggested that such an apparently non-adaptive physiological rhythm is related to the behavioural pattern of trout and reveals a basic crepuscular organisation. No endogenous rhythm was observed in continual light. These results suggest that control of photomechanical changes in rainbow trout has two components: an endogenous component, that causes the bimodal pattern in maintained darkness, and a direct effect of light, that maintains light adaptation throughout a normal day.

82-000803 Dubin, R. E. BEHAVIORAL INTERACTIONS BETWEEN CARIBBEAN REEF FISH AND EELS (MURAENIDAE AND OPHICHTHIDAE). *Copeia* 1982(1):229-232. 23 Feb. 1982. SFA 27(2)
[Dep. Zool., Univ. Alberta, Edmonton, AB T6G 2E9, Canada]

82-000804 Hayase, S. and S. Tanaka. INTER-SPECIFIC RELATIONS SURROUNDING THE THREE SPECIES OF EMBIOTOCID FISHES IN THE *ZOSTERA MARINA* BELT OF ODAWA BAY. *Bull. Jpn. Soc. Sci. Fish.* 47(10):1317-1322. Oct. 1981. SFA 27(2)
[SEAFDEC, P.O. Box 4, Phrapradaeng, Samutprakarn, Thailand] Inter-specific relations concerning three species of embiotocid fishes, *Ditrema viridis*, *Ditrema temmincki* and *Neoditrema ransonneti*, in the *Zostera* belt of Odawa Bay are discussed in the present paper. From the seasonal changes in fish fauna appearing in the *Zostera* belt, the utilization of the *Zostera* belt as a habitat of fishes was examined. *D. viridis* and *D. temmincki* are members of year-round residents and *N. ransonneti* is one of the seasonal residents. The 0+ age group of *D. viridis* and *D. temmincki* have high probability to come into contact with other year-round residents, especially *Rudarius ercodes*, which occur frequently in the catch and are predominant in the *Zostera* belt. These fishes tend to

BEHAVIOR (CONTINUED)

82-000804 CONTINUED reduce competition for the same food resources by means of different seasonal population fluctuation or segregation of microhabitat. The 0+ age of *N. ransonneti* mainly use the *Zostera* belt as a spawning of nursery ground.

82-000805 Hueter, R. E. and S. H. Gruber. RECENT ADVANCES IN STUDIES OF THE VISUAL SYSTEM OF THE JUVENILE LEMON SHARK (*NEGAPRION BREVIROSTRIS*). *Fla. Sci.* 45(1):11-25. 1982. SFA 27(2)
[Dep. Zool., Univ. Fla., Gainesville 32611] Due to its phyletic position among the selachians, its relative abundance in Florida coastal waters, and its unusual adaptability to laboratory conditions, the juvenile lemon shark is an excellent model for studies of the sensory biology of the "typical" shark. Our investigations of the physiological optics of the shark's eye have resulted in a mathematical model, or schematic eye, for the species. This optical model is centered around an ellipsoidal lens of high overall equivalent refractive index (1.664) and principal power (140 diopters), and yet all data indicate these animals to be hypermetropic (far-sighted) by about 3 diopters underwater, with no evidence of accommodation. Using the schematic eye, optical limitations on spatial vision of this shark are predictable. In addition to discussing the optics, we breifly reiew recent findings on the anatomical and functional organization of the retina, as well as psychophysical measurements of absolute visual threshold, in the juvenile lemon shark.

82-000806 Kavaliers, M. SCHOOLING BEHAVIOR OF FISH: AN OPIATE-DEPENDENT ACTIVITY? *Behav. Neural Biol.* 33(4):397-401. Dec. 1981. SFA 27(2)
[Dep. Zool., Univ. West. Ontario, London, ON N6A 5B7, Canada] Intraventricular administration of the opioid peptide, β-endorphin (5.0 pg $g^{-1}$ body weight) in goldfish significantly increases the cohesiveness and duration of schooling as well as decreasing the latency of school formation in response to external stimulation. Higher levels of β-endorphin (15.0 pg $g^{-1}$) decrease schooling behaviors. These endorphin effects could be blocked by prior systemic adminstration of naloxone, an opiate antagonist, supporting mediation of the effects of opioid receptors. Blockade of endogenous opiates by intraventricular injections of naloxone also decrease schooling abilities. These data suggest that endogenous opiate systems have a role in the regulation of schooling and social behaviors.

82-000807 Keyes, R. S. SHARKS: AN UNUSUAL EXAMPLE OF CLEANING SYMBIOSIS. *Copeia* 1982(1):225-227. 23 Feb. 1982. SFA 27(2)
[Sea World, Inc., 1720 South Shores Rd., San Diego, CA 92109]

82-000808 Kuenzer, P. ÄQUIVALENZKÄMPFE, VERHALTENSBEDINGTE UMFÄRBUNGEN UND SOZIALE ORGANISATION BEIM LÄNGSBANDSALMLER *NANNOSTOMUS BECKFORDI* (TELEOSTEI, LEBIASINIDAE). [UNDECIDED FIGHTS, BEHAVIOUR-INDUCED COLOUR CHANGE AND SOCIAL ORGANIZATION IN THE PENCILFISH *NANNOSTOMUS BECKFORDI* (TELEOSTEI, LEBIASINIDAE).] *J. Comp. Ethol.* 58(2):89-118. 1982. In German with English summ. SFA 27(2)
[Zool. Inst. Mus., Univ. Göttingen, West Germany]

82-000809 Leosch, J. G.; W. H. Kriete, Jr. and E. J. Foell. EFFECTS OF LIGHT INTENSITY ON THE CATCHABILITY OF JUVENILE ANADROMOUS *ALOSA* SPECIES. *Trans. Am. Fish. Soc.* 111(1):41-44. Jan. 1982. SFA 27(2)
[Va. Inst. Mar. Sci., Sch. Mar. Sci., Coll. William and Mary, Gloucester Point 23062]

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82-000810 Levine, J. S. and E. F. MacNichol, Jr. COLOR VISION IN FISHES. *Sci. Am.* 246(2):140-149. Feb. 1982. SFA 27(2)
[Dep. Biol., Boston Coll., Boston, MA]

82-000811 Liley, N. R. CHEMICAL COMMUNICATION IN FISH. *Can. J. Fish. Aquatic Sci.* 39(1):22-35. Jan. 1982. In English with French summ. SFA 27(2)
[Dep. Zool., Univ. British Columbia, Vancouver, BC V6T 2A9, Canada]

82-000812 MacCrimmon, H. R. and W. H. Robbins. INFLUENCE OF TEMPERATURE, WATER CURRENT, ILLUMINATION, AND TIME ON ACTIVITY AND SUBSTRATE SELECTION IN JUVENILE SMALLMOUTH BASS (*MICROPTERUS DOLOMIEUI*). *Can. J. Zool.* 59(12):2322-2330. Dec. 1981. In English with French summ. SFA 27(2)
[Dep. Zool., Univ. Guelph, Guelph, ON N1G 2W1, Canada] Behaviour of wild juvenile smallmouth bass, *Micropterus dolomieui*, in the laboratory was significantly influenced by water temperature, current, and illumination. Activity increased with increasing water temperature and (or) water current. When exposed to black and white substrate, selection of black was inversely dependent on temperature and current, and highly correlated with fish activity ($r = 0.995$, $P < 0.001$, inverse cubic relation). Substrate pattern influenced fish activity, aggregation, and social interaction. Activity levels increased with increasing incident illumination whereas selection of black substrate declined, particularly at higher water temperatures. Older juveniles became less active with age and preferred black substrate when available, thereby indicating a developing behavioural pattern which favours survival and energy conservation under natural nursery conditions by the discrete use of available cover.

82-000813 Okamoto, M.; O. Sato; T. Kuroki and T. Murai. [THE EFFECT OF DIVERS ON THE BEHAVIOR OF FISHES.] *Bull. Jpn. Soc. Sci. Fish.* 47(12):1567-1573. Dec. 1981. In Japanese with English summ. SFA 27(2)
[Fac. Fish., Hokkaido Univ., Minato, Hakodate 041, Japan] To elicit the effect of divers on the behavior of fishes, automatic underwater 16mm movie camera was prepared. At four artificial reefs, artificial seaweeds farm, concrete block reefs, stone reef and pearl farm, a movie camera was set on the sea floor for two successing days, at almost same time and the same place. On each day, movie was shot for about 30 minutes. On one day, no diver swam during shooting, and on the other day, a few divers investigated fish species and their amount around the camera. From the movies, number of fishes and fish species were analyzed. As the results, some phenomena concerning behavior of fishes were found to be as follows. (1) In the case of diving observation, most of the fishes made only slight escaping behavior and some fishes swam away quickly, when diver approached them. (2) When we compared the appearance rate of fishes on 16mm movie at manned condition and at unmanned condition, the former was 0.4-0.6 of the latter. (3) Number of fish species recognized from the movie was only 0.1-0.2 of the number of direct observation. So it was deduced that the direct observation of fishes living near artificial reefs to be very useful, even if the fault of changes on fish behavior could be seen.

82-000814 Pandey, K. and J. P. Shukla. BEHAVIOURAL STUDIES OF FRESHWATER FISHES DURING A SOLAR ECLIPSE. *Environ. Biol. Fishes* 7(1):63-64. 15 Jan. 1982. SFA 27(2)
[Dep. Zool., Univ. Gorakhpur, Gorakhpur 273001, U.P. India] Effects of a total eclipse on fish have rarely been recorded. Three freshwater fish species - *Amphipnous cuchia*, *Anabas testudineus* and *Colisa fasciata* were studied during the past total solar eclipse on February 16, 1980. Behavioural studies pertaining chiefly to fish movement, fish breathing and colouration were made, and possible reasons for effects are discussed.

## BEHAVIOR (CONTINUED)

82-000815 Pesaro, M.; M. Balsamo; G. Gandolfi and P. Tongiorgi. DISCRIMINATION AMONG DIFFERENT KINDS OF WATER IN JUVENILE EELS, *ANGUILLA ANGUILLA* (L.). *Monit. Zool. It.* 15(3):183-191. 1981. In English with Italian summ. SFA 27(2)
[Ist. Zool., Univ. Parma, Italy]

82-000816 Pitts, P. A. and W. S. Alevizon. THE COMPARATIVE USE OF FOOD AND SPACE BY THREE BAHAMIAN BUTTERFLYFISHES. *Fla. Sci.* 45(suppl. 1):24. 1982. Abstract only. SFA 27(2)
[Fla. Inst. Technol., Melbourne 32901] The use of food and space resources were compared among three butterflyfishes (*Chaetodon capistratus*, *C. striatus*, and *C. ocellatus*) inhabiting the same general Bahamian coral reef environment. These fish showed significant differences in their distribution and abundance patterns. Two species, *C. striatus* and *C. ocellatus*, displayed an almost perfect inverse correlation in abundance among the five reef "zones" investigated. The diets of these two were found to overlap extensively. The third species, *C. capistratus*, was found to broadly overlap the other two species in its use of space resources, but showed distinct differences in its use of food resources. The data supports the traditional view that coral reef fishes tend to avoid or reduce competition by specializations which enable them to partition available food and space resources.

82-000817 Reynolds, W. W. and M. E. Casterlin. THERMOREGULATORY BEHAVIOUR, DIEL ACTIVITY AND THE RELATIONSHIP OF SPONTANEOUS LOCOMOTOR ACTIVITY TO TEMPERATURE IN THE SEA RAVEN, *HEMITRIPTERUS AMERICANUS (GMELIN)*. *J. Fish Biol.* 20(1):1-4. Jan. 1982. SFA 27(2)
[Mar. Biol. Prog., Univ. New England, Biddeford, ME 04005] Twelve sea ravens, *Hemitripterus americanus*, were tested individually for three day periods in electronic shuttleboxes to measure their preferred and avoided temperatures, diel activity pattern and relationship of activity to temperature. The fish avoided temperatures below 9°C or above 25°C, preferring temperatures with a central tendency of 15-17°C. The fish were primarily nocturnal, being more active at night than by day. Locomotor activity increased eightfold between 10 and 20°C, but exhibited an anomalous decrease between 14 and 18°C, corresponding to the preferred-temperature zone, characteristic of maximal summer temperatures in the natural habitat.

82-000818 Risk, M. J. and P. W. Sammarco. BIOEROSION OF CORALS AND THE INFLUENCE OF DAMSELFISH TERRITORIALITY: A PRELIMINARY STUDY. *Oecologia (Berl.)* 52(3):376-380. Mar. 1982. SFA 27(2)
[Dep. Geol., McMaster Univ., Hamilton, ON L8S 4M1, Canada]

82-000819 Roitblat, H. L.; W. Tham and L. Golub. PERFORMANCE OF *BETTA SPLENDENS* IN A RADIAL ARM MAZE. *Anim. Learn. Behav.* 10(1):108-114. Feb. 1982. SFA 27(2)
[Columbia Univ., New York, NY 10027]

82-000820 Ross, M. J. and D. B. Siniff. TEMPERATURES SELECTED IN A POWER PLANT THERMAL EFFLUENT BY ADULT YELLOW PERCH (*PERCA FLAVESCENS*) IN WINTER. *Can. J. Fish. Aquatic Sci.* 39(2):346-349. Feb. 1982. In English with French summ. SFA 27(2)
[Dep. Ecol. Behav. Biol., Univ. Minn., Minneapolis 55455]

82-000821 Shpigel, M. NICHE ORVERLAP AMONG TWO SPECIES OF CORAL DWELLING FISHES OF THE GENUS *DASCYLLUS* (POMACENTRIDAE). *Environ. Biol. Fishes* 7(1):65-68. 15 Jan. 1982. SFA 27(2)

## BEHAVIOR (CONTINUED)

82-000821 CONTINUED
[George S. Wise Fac. Life Sci., Dep. Zool., Tel Aviv Univ., Tel Aviv, Israel] The two damselfish, *Dascyllus aruanus* and *D. marginatus* are coral-dwelling species, occurring in separate groups or together in the corals *Stylophora pistillata* and *Acropora* spp. The two species, however, occur together more frequently than would be expected by chance. The niches of these species overlap in space, time and food. Looking for mechanisms that allow such coexistance, it was found that in such a bispecific group, no difference exists in agonistic acts between intra- or interspecific encounter. This phenomenon seems to be produced by two independent mechanisms - random settling of juveniles from the plankton and predation pressure that strongly limits the re-settling of the fish.

82-000822 Shrode, J. B.; K. E. Zerba and J. S. Stephens, Jr. ECOLOGICAL SIGNIFICANCE OF TEMPERATURE TOLERANCE AND PREFERENCE OF SOME INSHORE CALIFORNIA FISHES. *Trans. Am. Fish. Soc.* 111(1):45-51. Jan. 1982. SFA 27(2)
[Sch. For. Resour., Univ. Ga., Athens 30602]

82-000823 Tavolga, W. N. AUDITORY ACUITY IN THE SEA CATFISH (*ARIUS FELIS*). *J. Exp. Biol.* 96:367-376. Feb. 1982. SFA 27(2)
[Mote Mar. Lab., Sarasota, FL]

82-000824 Veen, T. van and M. Andersson. THRESHOLD FOR SYNCHRONIZATION OF LOCOMOTOR ACTIVITY TO VISIBLE RADIATION IN THE EEL *ANGUILLA ANGUILLA*. *Oikos* 38(1):21-26. Jan. 1982. SFA 27(2)
[Dep. Zool., Univ. Lund, Helgonav. 3, S-223 62 Lund, Sweden]

82-000825 Waldman, B. QUANTITATIVE AND DEVELOPMENTAL ANALYSIS OF THE ALARM REACTION IN THE ZEBRA DANIO, *BRACHYDANIO RERIO*. *Copeia* 1982(1):1-9. 23 Feb. 1982. SFA 27(2)
[Sect. Neurobiol. Behav., Cornell Univ., Langmuir Lab., Ithaca, NY 14850]

82-000826 Webb, P. W. FAST-START RESISTANCE OF TROUT. *J. Exp. Biol.* 96:93-106. Feb. 1982. SFA 27(2)
[Sch. Nat. Resour., Univ. Mich., Ann Arbor 48109]

82-000827 Whitman, R. P.; T. P. Quinn and E. L. Brannon. INFLUENCE OF SUSPENDED VOLCANIC ASH ON HOMING BEHAVIOR OF ADULT CHINOOK SALMON. *Trans. Am. Fish. Soc.* 111(1):63-69. Jan. 1982. SFA 27(2)
[Coll. Fish. WH-10, Univ. Wash., Seattle 98195]

82-000828 Yonemori, T. [DRAG MEASUREMENTS OF FISH BODY AND CALCULATIONS OF DRAG POWER.] *Bull. Jpn. Soc. Sci. Fish.* 47(10):1329-1334. In Japanese with English summ. SFA 27(2)
[Fac. Fish., Kagoshima Univ., Kagoshima 890, Japan]

82-000829 Yonemori, T. [EFFECTS OF WATER TEMPERATURE ON THE SWIMMING POWER OF FISHES.] *Bull. Jpn. Soc. Sci. Fish.* 47(10):1335-1339. In Japanese with English summ. SFA 27(2)
[Fac. Fish., Kagoshima Univ., Kagoshima 890, Japan]

## LIFE HISTORY-GENERAL WORKS

82-000830 Biette, R. M.; D. P. Dodge; R. L. Hassinger and T. M. Stauffer. LIFE HISTORY AND TIMING OF MIGRATIONS AND SPAWNING BEHAVIOR OF RAINBOW TROUT (*SALMO GAIRDNERI*) POPULATIONS OF THE GREAT LAKES. *Can. J. Fish. Aquatic Sci.* 38(12):1759-1771. Dec. 1981. In English with French summ. SFA 27(2)
[Ontario Minist. Nat. Resour., Fish. Br., Queen's Park, Toronto, ON M7A 1W5, Canada]

82-000831 Binns, N. A. BONNEVILLE CUTTHROAT TROUT *SALMO CLARKI UTAH* IN WYOMING. *Wyo. Game Fish. Dep. Fish. Tech. Bull.* No. 5. vi + 107p. 1981. Available from Wyo. Game Fish Dep., Cheyenne. SFA 27(2)

82-000832 Burr, B. M. and R. L. Mayden. LIFE HISTORY OF THE BRINDLED MADTOM *NOTURUS MIURUS* IN MILL CREEK, ILLINOIS (PISCES: ICTALURIDAE). *Am. Midl. Nat.* 107(1):25-41. Jan. 1982. SFA 27(2)
[Dep. Zool. South Ill. Univ., Carbondale 62901] The life history of *Noturus miurus* was studied from collections made at Mill Creek, Pulaski Co., Illinois, between 27 August 1978 and 27 October 1979. A total of 318 specimens ranging in age from 1-36 months were collected and six nests with guardian males were found. *Noturus miurus* is syntopic with *N. nocturnus* in Mill Creek; *N. miurus* usually occupied mud-bottom, debris-ridden pools and *N. nocturnus* generally inhabited rocky or brushy riffles. Males were sexually mature at 2 years, and during the breeding season their heads, lips and genital papillae were swollen. Females had mature ova from May to July; some females reached sexual maturity by 1 year. The number of mature oocytes produced by a female ranged from 42-90($\bar{x}$ = 66.2). The nesting season spanned at least 19-28 June 1979 when water temperatures ranged from 24-27 C. Six nests, each containing a single clutch of eggs and each guarded by a single male, were found in 355-ml beer cans and under flat rocks in quiet pools. Clutch size ranged from 56-81($\bar{x}$ = 66.2); eggs were spherical and yellow or amber in color and ranged in size from 3.4-3.8 mm ($\bar{x}$ = 3.5). Clutches of eggs incubated in the laboratory at 25 C hatched in 189 to 215 hr with a hatching success of 86%. Individual *Noturus miurus* grew at a decreasing rate in standard length and at a constant rate in body weight for a least 3 years. One-half of the 1st year's mean growth in length was reached in ca. 8 weeks; about 10 months was required to attain one-half of the 1st year's mean weight. The largest fish collected at Mill Creek was 79 mm. Aquatic dipteran larvae and pupae, ephemeropteran naiads, trichopteran larvae and adult isopods were the predominant food items in the 107 stomachs examined. Diversity of diet tended to increase with increasing size. *Noturus miurus* was frequently parasitized by nematodes and less frequently by flukes and parasitic copepods.

82-000833 Díaz-Machuca, J. L. BIOLOGY OF THE ICTALURIDS IN THE VICENTE GUERRERO RESERVOIR (LAS ADJUNTAS), TAMAULIPAS, MEXICO. *Proc. Desert Fishes Counc.* 12:81-82. 1980(1981). In English and Spanish. Abstract only. SFA 27(2)
[Lab. Ictiol. Pesq., Fac. Cienc. Biol., Univ. Autónoma, Nuevo Leon, Mexico]

82-000834 Gruber, S. H. and L. J. V. Compagno. TAXONOMIC STATUS AND BIOLOGY OF THE BIGEYE THRESHER, *ALOPIAS SUPERCILIOSUS*. *NOAA Fish. Bull.* 79(4):617-640. Oct. 1981. SFA 27(2)
[Rosenstiel Sch. Mar. Atmos. Sci., Univ. Miami, 4600 Rickenbacker Causeway, Miami, FL 33149]

## LIFE HISTORY-GENERAL WORKS (CONTINUED)

82-000835 Haas, R. NOTES ON THE ECOLOGY OF *APHANIUS DISPAR* (PISCES, CYPRINODONTIDAE) IN THE SULTANATE OF OMAN. *Freshwater Biol.* 12(1):89-95. Feb. 1982. SFA 27(2)

[Dep. Biol., Calif. State Univ., Fresno 93740] *Aphanius dispar* was observed in the field and some simple laboratory studies were undertaken in Oman. *A. dispar* is almost totally ubiquitous in all bodies of fresh water where it occupies a wide range of habitats differing in stream flow, water chemistry, temperature and substrate quality. It often is found in association with one or both of two cyprinid fishes, *Cyprinion* and *Garra*. *Aphanius* is tolerant of wide ranges of salinity up to full marine water and has a wide temperature range. *A. dispar* resembles *Cyprinodon* species in a number of particulars, probably reflecting phylogenetic relationships and a common evolutionary response to desert conditions. It breeds throughout the year with a probable peak in the months of April to June.

82-000836 Hubbs, C. LIFE HISTORY DYNAMICS OF *MENIDIA BERYLLINA* FROM LAKE TEXOMA. *Am. Midl. Nat.* 107(1):1-12. Jan. 1982. SFA 27(2)

[Dep. Zool., Univ. Tex., Austin 78712] Life history calculations for Lake Texoma *Menidia beryllina* (Cope) show that female fecundity is size-dependent with egg numbers ranging up to ca. 2000 eggs per female per day of a 3-month breeding period. During that time female growth cannot be demonstrated and extensive mortality results in virtually no adults surviving to spawn a 2nd year. Growth is density-dependent and reproduction can occur if young-of-the-year achieve minimum spawning size before water temperatures exceed the maximum breeding limit of ca. 30C.

82-000837 Ihssen, P. E.; D. O. Evans; W. J. Christie; J. A. Reckahn and R. L. DesJardine. LIFE HISTORY, MORPHOLOGY, AND ELECTROPHORETIC CHARACTERISTICS OF FIVE ALLOPATRIC STOCKS OF LAKE WHITEFISH (*COREGONUS CLUPEAFORMIS*) IN THE GREAT LAKES REGION. *Can. J. Fish. Aquatic Sci.* 38(12):1790-1807. Dec. 1981. In English with French summ. SFA 27(2)

[Ontario Minist. Nat. Resour., Res. Sect., Fish. Br., Maple, ON L0J 1E0, Canada]

82-000838 Kanno, Y. [ON THE LIFE HISTORY OF HERRING, *CULPEA PALLASII* CUVIER ET VALENCIENNES, IN THE BRACKISH LAKE NOTORO, HOKKAIDO. III. REPRODUCTIVE CHARACTERISTICS AND FEEDING HABITS.] *Bull. Fac. Fish. Hokkaido Univ.* 32(4):316-328. Nov. 1981. In Japanese with English summ. SFA 27(2)

[Lab. Biol. Fish Popul., Fac. Fish., Hokkaido Univ., Hokodate, Japan]

82-000839 Levy, D. A. and T. G. Northcote. JUVENILE SALMON RESIDENCY IN A MARSH AREA OF THE FRASER RIVER ESTUARY. *Can. J. Fish. Aquatic Sci.* 39(2):270-276. Feb. 1982. In English with French summ. SFA 27(2)

[Westwater Res. Cent., Univ. British Columbia, 2075 Wesbrook Mall, Vancouver, BC V6T 1W5, Canada]

82-000840 Lewis, D. S. C. PRELIMINARY COMPARISONS BETWEEN THE ECOLOGY OF THE HAPLOCHROMINE CICHLID FISHES OF LAKE VICTORIA AND LAKE MALAWI. *Neth. J. Zool.* 31(4):746-761. Dec. 1981. SFA 27(2)

[Minist. For. Nat. Resour., Fish. Dep., Fish Res. Stn., Malawi]

82-000841 McBride, F. T.; R. I. Jones and F. A. Harris. GROWTH RATES AND FOOD HABITS OF ROANOKE BASS IN THE ENO AND TAR RIVERS, NORTH CAROLINA. *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:341-348. 1980[1981]. SFA 27(2)

[Div. Inland Fish., N.C. Wildl. Resour. Comm., Raleigh 27611] Two hundred and thirty Roanoke bass (*Ambloplites cavifrons*) were collected from the

LIFE HISTORY-GENERAL WORKS (CONTINUED)

82-000841 CONTINUED Tar and Eno rivers in Piedmont, North Carolina. Seven age groups (1 to 7) were collected from the Tar River and 5 age groups (1 to 5) were collected from the Eno River. Mean back-calculated total lengths were similar in both rivers. Five-year old fish from the Tar River averaged 246mm and from the Eno River 243mm. Roanoke bass were generally opportunistic feeders, but larger individuals selectively fed on crayfish (*Cambarus* sp.) and fish. Feeding appeared to be concentrated in vegetated riffle areas.

82-000842 Medel-Ulmer, L. MOVEMENT AND REPRODUCTION OF THE RAZORBACK SUCKER (*XYRAUCHEN TEXANUS*) INHABITING SENATOR WASH RESERVOIR, IMPERIAL COUNTY, CALIFORNIA. *Proc. Desert Fishes Counc.* 12:106. 1980(1981). Abstract only. SFA 27(2)
[Calif. State Univ., Long Beach 90840]

82-000843 Power, G. STOCK CHARACTERISTICS AND CATCHES OF ATLANTIC SALMON (*SALMO SALAR*) IN QUEBEC, AND NEWFOUNDLAND AND LABRADOR IN RELATION TO ENVIRONMENTAL VARIABLES. *Can. J. Fish. Aquatic Sci.* 38(12):1601-1611. Dec. 1981. In English with French summ. SFA 27(2)
[Dep. Biol., Univ. Waterloo, Waterloo, ON N2L 3G1, Canada]

82-000844 Rinne, W. E. ASPECTS OF THE LIFE HISTORY AND DISTRIBUTION OF THE VIRGIN SPINEDACE (*LEPIDOMEDA MOLLISPINIS*). *Proc. Desert Fishes Counc.* 12:119-122. 1980(1981). In English and Spanish. Abstract only. SFA 27(2)
[Water Power Resour. Serv., Boulder City, NV] The Virgin Spinedace (*Lepidomeda mollispinis*) is a member of a unique, endemic tribe, the Plagopterini, of the western cyprinids. Prior to 1960 little was written on the classification, distribution or biology of this species (Miller and Hubbs, 1960). This paper reports the results of field and laboratory investigations on the Virgin Spinedace from October 1969 through March 1971. Discussion is also presented on changes in distribution and relative abundance as determined by this study when compared to results of a study by Cross (1975) from June 1973 through March 1975. Spinedace prefer clean, cool, moderately swift streams of relatively shallow depth. Insect material is the preferred food and plant material is utilized only when insect availability is low. Spawning occurs once each year, lasting from spring through early summer. The majority of spawners in the population during this study were Age Group I fish. Some Age Group III fish may spawn twice during a spawning season as demonstrated by fecundity studies. Maturation of gonads appears to be regulated in part by increasing water temperature, discharge and photoperiod. The majority of the population in the study area were Age Group 0 or Age Group I fish. Females appeared to live longer than males and dominate Age Group II and III collections. Distribution was found to be similar to apparent historic distribution but population reduction has occurred because of loss of habitat and competition and predation from introduced exotics. Spinedace populations have declined in the Virgin River since the 1930's. At present, small intact populations exist near the mouth of Beaver Dam Creek, the north and lower east fork of the Virgin River in Zion National Park, and portion of the Santa Clara River and its tributaries (Cross 1975). The continued decline in distribution and abundance of spinedace as demonstrated by Rinne (1971) and Cross (1975) signal the need for a closer review of the status of this species.

82-000845 Rosen, R. A.; D. C. Hales and D. G. Unkenholz.. BIOLOGY AND EXPLOITATION OF PADDLEFISH IN THE MISSOURI RIVER BELOW GAVINS POINT DAM. *Trans. Am. Fish. Soc.* 111(2):216-222. Mar. 1982. SFA 27(2)
[Natl. Wildl. Fed., 1412 16th St., NW, Washington, DC 20036]

LIFE HISTORY-GENERAL WORKS (CONTINUED)

82-000846 Shafi, M. and B. M. Jasim. SOME ASPECTS OF THE BIOLOGY OF A CYPRINID, *ASPIUS VORAX* HECKEL. *J. Fish Biol.* 20(3):271-278. Mar. 1982. SFA 27(2)

[Nat. Hist. Res. Cent., Univ. Baghdad, Iraq] Scales were used for the determination of age with back-calculation of length. The oldest fish was VII+ years old. Back-calculation did not exhibit Lee's phenomenon. The most rapid growth occurred in summer at water temperautres over 25°C. The growth in weight was *c.*331g year$^{-1}$ after IV years of life. Growth was well described by von Bertalanffy equation: $l_t$-91.0[$l=^{0\cdot 122}(^{t-0\cdot 25})$)]. The length-weight relationship followed the cube law (*b*=3.0601) $K_n$ ranged from 0.74 to 1.18 with a mean value of 1.0. Spawning occurred in January, fecundity was 74 509 with a mean of 1157 eggs g$^{-1}$ body weight. Mean diameter of eggs was 1071 (μm). A developed ovary had ova of two sizes, immature oocytes and mature ova. The fish is a carnivorous feeder.

82-000847 Shlossman, P. A. and M. E. Chittenden, Jr. REPRODUCTION, MOVEMENTS, AND POPULATION DYNAMICS OF THE SAND SEATROUT, *CYNOSCION ARENARIUS*. *NOAA Fish. Bull.* 79(4):649-669. Oct. 1981. SFA 27(2)

[Dep. Wildl. Fish. Sci., Tex. A&M Univ., College Station 77843] *Cynoscion arenarius* females mature at 140-180 mm total length as they approach age I. Spawning occurs from early March through September, but concentrates in a distinct spring period (March-May) and a distinct late summer period (August-September). Spawning occurs in the inshore Gulf of Mexico and coincoides with the periodicity of onshore winds and surface currents which probably transport eggs or larvae to estuarine and inshore gulf nurseries. Estuarine nurseries may be most important to late summer spawned groups. The main gulf nursery in the northwestern area is in waters shallower than 18m. Both spawned groups leave estuarine nurseries in fall to overwinter in the gulf. Late summer spawned groups return to estuaries in midspring but reenter the gulf in August to spawn. Fish average 210-280 mm total length at age I but some were 300 mm. Predicted sizes of late summer fish were 425 mm total length at age II and 574 mm at age III. The largest trawled specimen was 342 mm total length and 99.5% were less than 280 mm. No more than three spawned groups or two year classes occurred at any one time. The typical maximum lifespan is 1-2 years based on trawl data and possibly as much as 2-3 years for other gear. Total annual mortality rate was 99.79% based on trawling data and appears no lower than 80-90% if maximum lifespan typically is as great as 3 years. *Cynoscion arenarius* can be aged using scales. Total weight-total length, girth-total length, and standard length-total length regressions are presented. Temporal isolation of the two spawned groups produced each year suggests they may be separate populations or species. The life history and population dynamics of *C. arenarius* appear similar to *C. regalis* along the Atlantic coast south of Cape Hatteras, North Carolina. The latter taxon shows zoogeographic change at Cape Hatteras, which needs management consideration.

82-000848 Snelson, F. F., Jr. and T. J. Mulligan. BIOLOGY OF THE BULL SHARK IN THE INDIAN RIVER LAGOON, FLORIDA. *Fla. Sci.* 45(suppl. 1):27. 1982. Abstract only. SFA 27(2)

[Dep. Biol. Sci., Univ. Cent. Fla., Orlando 32816] The bull shark, *Carcharhinus leucas*, is the most common shark in the brackish Indian River lagoon system on the central east coast of Florida. The biology of the lagoon population was studied between May 1975 and May 1979. Pregnant females, 240-265 cm long, move into the lagoons in the spring and early summer and give birth in June and July to young that average about 75 cm long. The females leave the lagoons after parturition. Young and juvenile sharks stay in the lagoons for about 3 years, until they are 180-200 cm long. There may be some emigration from the lagoons in winter, especially in yearlings. Subadult sharks leave the lagoons permanently as they begin to mature, and join the population of adults that apparently resides in deeper offshore waters. Juvenile bull sharks in the lagoon system feed primarily on stingrays and marine catfishes.

## LIFE HISTORY-GENERAL WORKS (CONTINUED)

82-000849 Snyder, W. S. GROWTH AND MORTALITY OF LARVAL FRESHWATER DRUM (*APLODINOTUS GRUNNIENS*) IN THE MAUMEE RIVER ESTUARY. *Ohio J. Sci.* 82(2):8-9. 1982. Abstract only. SFA 27(2)
[Cent. Lake Erie Area Res., Ohio State Univ., 484 W. 12th Ave., Columbus 43210] Cumulative catch curve analysis was used in the determination of instantaneous growth and mortality rates for larval freshwater drum (*Aplodinotus grunniens*) in the lower Maumee River. Collections made at two sampling ranges indicated that two hatches had occurred during the 1977 spawn. Ichthyoplankton populations were significantly affected by currents within the lower river, which is noted as being a freshwater estuary. Growth rates (G) calculated ranged from .03-.09. Mortality (Z) rates ranged from -.11 to -.33.

82-000850 Stephens, R. T. T. REPRODUCTION, GROWTH AND MORTALITY OF THE COMMON BULLY, *GOBIOMORPHUS COTIDIANUS* MCDOWALL, IN A EUTROPHIC NEW ZEALAND LAKE. *J. Fish Biol.* 20(3):259-270. Mar. 1982. SFA 27(2)
[Sch. Sci., Univ. Waikato, Hamilton, New Zealand] *Gobiomorphus cotidianus* in Lake Waahi, North Island, New Zealand, (37° 34' S; 175° 08' E) spawned continuously between July 1976 and March 1977. Length frequency data indicated that two, and briefly, three year classes, were present, each made up of three groups which were the progeny from successive peaks in spawning activity. Scale examination revealed checks to growth associated with spawning and stressful midsummer conditions. These and length frequency data were used in growth estimates which indicated that bullies reached 3.5-4.0 cm after their first year, 5-6 cm after their second but did not survive a third year. Mortality was associated with spawning and midsummer stress.

82-000851 Surat, E. M.; W. J. Matthews and J. R. Bek. COMPARATIVE ECOLOGY OF *NOTROPIS ALBEOLUS*, *N. ARDENS* AND *N. CERASINUS* (CYPRINIDAE) IN THE UPPER ROANOKE RIVER DRAINAGE, VIRGINIA. *Am. Midl. Nat.* 107(1):13-24. Jan. 1982. SFA 27(2)
[W. J. Matthews: Dep. Biol., Univ. Okla., Kingston 73439] Foods, feeding periodicity and microhabitat use are reported for coexisting *Notropis albeolus*, *N. ardens* and *N. cerasinus* in the upper Roanoke River drainage, Virginia. All three species primarily occupied pool habitats, ate aquatic insect larvae or terrestrial adult insects, and were diurnal feeders. *Notropis ardens* (subgenus *Lythrurus*) was ecologically segregated from *N. albeolus* and *N. cerasinus* (both subgenus *Luxilus*) in vertical spacing in the water column and in taxa of foods used. The two *Luxilus* species were ecologically more similar, segregated only by vertical differences in microhabitat. Overlaps in resource use among the three species pairs suggested congruence of phylogenetic and ecological similarities.

82-000852 Vigg, S. and P. A. Kucera. CONTRIBUTIONS TO THE LIFE HISTORY OF SACRAMENTO PERCH, *ARCHOPLITES INTERRUPTUS*, IN PYRAMID LAKE, NEVADA. *Great Basin Nat.* 41(3):278-289. 30 Sept. 1981. SFA 27(2)
[Bioresour. Cent., Desert Res. Inst., Reno, NV 89506] During a two-year period (1976-1977), 180 Sacramento perch (*Archoplites interruptus*) were sampled from Pyramid Lake, Nevada, on a monthly basis using several capture methods in all lake areas. Age and growth determinations of these fish were inconsistent with previous research on this species. Sacramento perch are entirely carnivorous, adults feeding primarily on tui chub (*Gila bicolor*). Fish accounted for 6 percent of the diet (by volume) of Sacramento perch less than 300 mm fork length, and 98 percent for those exceeding 300 mm. Amphipods, Odonata, and Chironomidae composed 6.3, 5.7, and 1.8 percent, respectively, of the stomach contents by volume for all sizes combined. Females spawned from June to August when water temperatures approached 20 C, and their gonad weight was about 6 percent of the total body

## LIFE HISTORY-GENERAL WORKS (CONTINUED)

82-000852 CONTINUED weight. A sample of 20 female perch had a mean fecundity of 84,203 eggs. The mean diameter of mature eggs was 0.88 mm. Sacramento perch almost exclusively inhabit the littoral zone of Pyramid Lake. Activity, as indicated by net catches, was greatest during the warm months of May to October. Monthly catches were significantly correlated with temperature (r=0.577, P<0.01). No short-term changes in population abundances were observed during 1976-1977.

82-000853 Ware, D. M. POWER AND EVOLUTION FITNESS OF TELEOSTS. *Can. J. Fish. Aquatic Sci.* 39(1):3-13. Jan. 1982. In English with French summ. SFA 27(2)
[Dep. Fish. Oceans, Resour. Serv. Br., Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada]

## POPULATION STUDIES, PRODUCTION, RECRUITMENT, ETC.

82-000854 Archibald, C. P.; W. Shaw and B. M. Leaman. GROWTH AND MORTALITY ESTIMATES OF ROCKFISHES (SCORPAENIDAE) FROM B.C. COASTAL WATERS, 1977-1979. *Can. Tech. Rep. Fish. Aquatic Sci.* No. 1048. iv + 57p. Dec. 1981. In English with French summ. SFA 27(2)
[Dep. Fish. Oceans, Resour. Serv. Br., Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada] Estimated parameters of total and natural instantaneous mortality, as well as von Bertalanffy growth parameters are presented for 10 species of rockfish (genus *Sebastes*) from British Columbia coastal waters. These estimates were derived from analysis of ageing data obtained through the application of new ageing techniques. The estimated longevity of species in this genus increased considerably (up to 80+y) as a result of this work. Concomitantly, estimates of instantaneous mortality were reduced substantially (_50%) from previously published estimates. For unexploited or lightly exploited stocks estimates of Z ranged from 0.01-0.07, while for heavily exploited stocks the corresponding estimates ranged 0.09-0.18. Estimated parameters of growth changed relatively little from published values, largely because increased longevity occurs after major inflections in linear growth. Von Bertalanffy growth parameters presented here do not describe growth throughout life due to the lack of younger fish in the data set. The extension of age compositions past the point of major decreases in linear growth implies that the use of age-length keys for rockfishes, in British Columbia waters at least, is invalid.

82-000855 Aro, E. and V. Sjöblom. THE ABUNDANCE OF COD IN THE SEAS AROUND FINLAND IN 1974-80. *Int. Counc. Explor. Sea* C.M. 1981/J:20. 14p. 1981. In English with French summ. SFA 27(2)
[Finnish Game Fish. Res. Inst., P.O. Box 193, SF-00131 Helsinki 13, Finland]

82-000856 Aro, E.; V. Sjöblom; P. Suuronen and R. Parmanne. THE ABUNDANCE OF BALTIC HERRING AND SPRAT IN THE SEAS AROUND FINLAND IN 1979 AND 1980 ACCORDING TO ECHO COUNTING. *Int. Counc. Explor. Sea* C.M. 1981/J:21. 18p. 1981. In English with French summ. SFA 27(2)
[Finnish Game Fish. Res. Inst., P.O. Box 193, SF-00131 Helsinki 13, Finland]

82-000857 Clayton, J. W. THE STOCK CONCEPT AND THE UNCOUPLING OF ORGANISMAL AND MOLECULAR EVOLUTION. *Can. J. Fish. Aquatic Sci.* 38(12):1515-1522. Dec. 1981. In English with French summ. SFA 27(2)

## POPULATION STUDIES, PRODUCTION, RECRUITMENT, ETC. (CONTINUED)

82-000857 CONTINUED
[Dep. Fish. Oceans, Freshwater Inst., 501 University Crescent, Winnipeg, MB R3T 2N6, Canada]

82-000858 Coombs, C. and C. E. Bond. STATUS OF THE WARNER SUCKER (*CATOSTOMUS WARNERENSIS*). *Proc. Desert Fishes Counc.* 12:76. 1980(1981). Abstract only. SFA 27(2)
[Oreg. State Univ., Corvallis] The Warner sucker, once abundant in the Warner Valley, was reduced to remnant populations following development of irrigation systems in the valley. Diversion dams and ditches disrupted natural waterways, preventing access to spawning grounds and diverting fish down irrigation ditches. Although rare 20 years ago and not numerous now the species retains a wide distribution in the valley and at least 4 separate spawning populations so that single deleterious events should not wipe out all spawners. The life span is at least 9 years and maturity is reached in 3 years so that each year class has a long reproductive life. The greatest threat to the species is irrigation structures and artificial waterways, but the introduction of centrarchids and ictalurids constitutes a threat. We recommend that the species be listed as threatened, that additional study on distribution be done, that critical habitat be identified and protected, and that laws and regulations governing water use and fish life be enforced.

82-000859 Guillory, V. and R. Bejarano. EVALUATION OF JUVENILE MENHADEN ABUNDANCE DATA FOR PREDICTION OF COMMERCIAL HARVEST. *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:193-203. 1980[1981]. SFA 27(2)
[La. Dep. Wildl. Fish., Mar. Res. Lab., Grand Isle 70358] Juvenile gulf menhaden (*Brevoortia patronus*) data were extracted from otter trawl surveys conducted along the Louisiana coast since 1966. The relationships between various abundance indexes and commercial harvest of age-1 fish were determined by correlation and linear regression analyses. Several indexes were significantly correlated at the 0.95 and 0.99 level with commercial harvest. The strongest indexes, involving frequency of occurrence of more than 25 or 50 gulf menhaden in samples, were used to predict commercial landings. Recommendations were made to continue monitoring the relationship between these abundance indexes and commercial harvest.

82-000860 Halling, F. and J. Salmi. ABUNDANCE, GROWTH AND MORTALITY OF AUTUMN-SPAWNING BALTIC HERRING LARVAE OFF THE COAST OF FINLAND. *Int. Counc. Explor. Sea.* C.M. 1981/J:22. 15p. 1981. In English with French summ. SFA 27(2)
[Finnish Game Fish. Res. Inst. Åland Isl. Field Stn., Öhbergsvæagen 1, SF-22100 Marieham, Finland]

82-000861 Hanson, J. M. and W. C. Leggett. EMPIRICAL PREDICTION OF FISH BIOMASS AND YIELD. *Can. J. Fish. Aquatic Sci.* 39(2):257-263. Feb. 1982. In English with French summ. SFA 27(2)
[Dep. Biol., McGill Univ., 1205 Ave. Docteur Penfield, Montreal, PQ H3A 1B1, Canada]

82-000862 Harvey, G. and R. Fortin. REPRODUCTION ET DYNAMIQUE DE POPULATION DE LA BARBOTTE BRUNE *ICTALURUS NEBULOSUS* (LE SUEUR) DANS LA FRAYÈRE DE LA RIVIÈRE AUX PINS, FLEUVE SAINT-LAURENT, PRÈS DE MONTRÉAL, QUÉBEC. [REPRODUCTION AND POPULATION DYNAMICS OF BROWN BULLHEADS *ICTALURUS NEBULOSUS* (LE SUEUR) ON THE SPAWNING GROUNDS ON THE RIVIÈRE AUX PINS, ST. LAWRENCE RIVER, NEAR MONTREAL (QUEBEC).] *Can. J. Zool.* 60(1):31-39. Jan. 1982. In French with English summ. SFA 27(2)
[Serv. Amenage. Exploitation Faune, Minist. Loisir, Chasse Pêche, Jonquière, PQ G7X 8L6, Canada]

## POPULATION STUDIES, PRODUCTION, RECRUITMENT, ETC. (CONTINUED)

82-000863 Horrall, R. M. BEHAVIORAL STOCK-ISOLATING MECHANISMS IN GREAT LAKES FISHES WITH SPECIAL REFERENCE TO HOMING AND SITE IMPRINTING. *Can. J. Fish. Aquatic Sci.* 38(12):1481-1496. Dec. 1981. In English with French summ. SFA 27(2)
[Mar. Stud. Cent., Univ. Wis., Madison 53706]

82-000864 Iles, T. D. and M. Sinclair. ATLANTIC HERRING: STOCK DISCRETENESS AND ABUNDANCE. *Science* 215(4533):627-633. 5 Feb. 1982. SFA 27(2)
[Bedford Inst. Oceanogr., P.O. Box 1006, Dartmouth, NS B2Y 4A2, Canada] The number of genetically distinct herring stocks is determined by the number of distinct, geographically stable larval retention areas. Spawning sites in these areas may be highly localized or dispersed. Absolute population size mostly depends on the retention area available to the density-dependent larval-postlarval stage. Although the extreme seasonal range of spawning time shown by Atlantic herrings is not fully accounted for by a new hypothesis, current theory is not supported by the hypothesis or by empirical data. The management implications are discussed.

82-000865 Jensen, A. L. EXPLOITATION AND EXPECTED NUMBER OF SPAWNINGS OF LAKE WHITEFISH *COREGONUS CLUPEAFORMIS*. *Oikos* 38(2):250-252. Mar. 1982. In English with Russian summ. SFA 27(2)
[Sch. Nat. Resour., Univ. Mich., Ann Arbor 48109] Exploited lake whitefish (*Coregonus clupeaformis*) populations often collapse, apparently as a result of recruitment failure. The expected number of spawnings per recruit could be an important variable for assessment of these stocks. In this study an equation is developed for calculation of the expected number of spawnings per recruit as a function of fishing mortality and age at vulnerability to the fishing gear. The exploitation of this population has resulted in an expected number of spawnings per recruit of near zero.

82-000866 Jester, D. B. and R. R. Suminski. AGE AND GROWTH, FECUNDITY, ABUNDANCE, AND BIOMASS PRODUCTION OF THE WHITE SANDS PUPFISH, *CYPRINODON TULAROSA* (CYPRINODONTIDAE), IN A DESERT POND. *Southwest. Nat.* 27(1):43-54. 19 Feb. 1982. SFA 27(2)
[Div. Nat. Sci. Math., Northeast. State Univ., Tahlequah, OK 74464] The White Sands pupfish (*Cyprinodon tularosa*) was introduced into a 0.1-ha, shallow, saline, eutrophic desert pond in the Tularosa Basin, New Mexico, in 1973. Life history investigations and a populaton estimate were made in 1975 and 1976. Maximum longevity of the pup-fish was 5 years, at which age they were 56.2 mm total length and weighed 3.4 g. The length-weight relationship was $\log W=-5.25601 + 3.30845 \log L$. Weight of fish when each annulus formed was computed. Mean fecundity ranged from 810 ova per female in Age Group I to 2,996 in Age Group IV, with a grand mean of 1,140. A Schnabel estimate of 12,520 trappable-size fish was expanded to form a survival curve described by $\log S = 3.74658 - 5.99959 \log A$, which showed that the population varied from 1,950,583 to 30,527 during the year. Mean standing crop biomass was 13.344 kg. The population and length-weight curves were integrated to compute estimates of live-weight biomass production of White Sands pupfish in each age group during 0.1-yr intervals. Total annual somatic production was 25.309 kg. Ratio of production to standing crop biomass was 1.90 or 190%. Production of 2.448 kg of eggs was estimated separately. Production rates of 25.3 $g/m^2/yr$ of somatic tissue, 2.5 $g/m^2/yr$ of eggs, and 27.8 $g/m^2/yr$ of total production are relatively high among fish at trophic level $A_3$. Fish in Age Group 0 accounted for 91.6% of the live-weight biomass produced and Age Group I accounted for 8%. A high rate of total production, extremely high rates of production by the youngest age groups, and a large ratio of production to standing crop biomass indicate that the population was below carrying capacity and was expanding.

## POPULATION STUDIES, PRODUCTION, RECRUITMENT, ETC. (CONTINUED)

82-000867 McDonald, M. E.; B. E. Cuker and S. C. Mozley. DISTRIBUTION, PRODUCTION, AND AGE STRUCTURE OF SLIMY SCULPIN IN AN ARCTIC LAKE. *Environ. Biol. Fishes* 7(2):171-176. 15 Mar. 1982. SFA 27(2)
[Zool. Dep., N.C. State Univ., Raleigh 27650] Slimy sculpins (*Cottus cognatus*) were caught in the littoral region of Toolik Lake, an arctic lake. These sculpins grew slower and lived longer (71 mm at 8 years) than more southerly populations. Sculpin distribution along the slope of the rocky littoral zone was greatest at the 3.5 m depth and coincided with the rock-mud interface. The hypothesis that this 'preferred' area provided both increased prey and reduced predation was advanced. Yearly production estimate of littoral sculpins was 0.40 g · m$^{-2}$ · yr$^{-1}$ with a P/B ratio of 0.36. This is considerably less than estimates for more southerly populations of the same species.

82-000868 Methot, R. D., Jr. GROWTH RATES AND AGE DISTRIBUTIONS OF LARVAL AND JUVENILE NORTHERN ANCHOVY, *ENGRAULIS MORDAX*, WITH INFERENCES ON LARVAL SURVIVAL. *Ph.D. dissertation, Univ. Calif. (San Diego)* 328p. 1981. From Diss. Abstr. Int. B Sci. Eng. 42(7):2651. Jan. 1982. SFA 27(2)
Variation in the high mortality of marine fish larvae may be a major cause of fluctuations in abundance of adult fish stocks. It has often been suggested that variation in mortality occurs because of the dependence of larval survival on high concentrations of suitable prey. My studies on age and growth improve the precision of larval mortality estimates, introduce a new measure of larval survival, and indicate the incidence of malnourished larvae in the sea. Daily increments in otoliths of larval and juvenile northern anchovy, *Engraulis mordax*, were counted and measured. Growth rates were estimated from the relation between age and body size and from the width of the increments. Growth from 4.3mm standard length, the size at yolk absorption, to about 23mm was expressed using the Gompertz growth equation with maximum growth rate occurring at a size of 10mm. The growth of larvae estimated from the width cf recently deposited increments was similar to growth estimated from the relation between size and age. These two estimates of mean growth would have differed if mortality rate [illegible]d been correlated with growth rate. Growth rate at 10mm varied sesonally: 0.43mm/day in January to 0.7mm/day in August. In each season mean growth was similar to the growth of *ad libitum* fed larvae in the laboratory at the seasonal temperatures. Within season, variance in growth was small and not correlated with temperature. I conclude that early larvae typically obtain an adequate ration. Late larvae (23-40mm) typically grew 0.30-0.35mm/day. Growth increased at 40mm to 0.4-0.6mm/day. Engraulids typically complete transformation at aobut 40mm and are soon capable of filter feeding. Growth of juveniles larger than 60mm was about 0.3mm/day during the late summer but declined to 0.1mm/day for December. Juveniles are capable of more rapid growth in the laboratory. The potential for density dependent growth of juveniles is considered. Significant spawning in 1978 and 1979 occurred from December to May and peaked in March. The ages of juveniles collected in autumn of 1978 and 1979 indicated that neither yearclass was dominated by individuals born during a short period of the spawning season but March was the commonest month of birth. Comparison of the birthdate distributions to the respective spawning distributions indicates that larval survival was similar in the first half of each spawning season but was greater in April to May of the 1978 season than the same period of 1979. This difference in seasonal survival in nearly sufficient to account for the two-fold greater recruitment in 1978 and 1979. The seasonal patterns of survival through the larval state were not related to larval growth or mortality during the early larval stage but were consistent with changes in offshore drift inferred from monthly upwelling indices.

82-000869 Parmanne, R. and V. Sjöblom. ABUNDANCE, MORTALITY AND PRODUCTION OF SPRING-SPAWNING BALTIC HERRING LARVAE IN THE SEAS AROUND FINLAND IN 1980. *Int. Counc. Explor. Sea.* C.M. 1981/J:23. 15p. 1981. In English with French summ. SFA 27(2)
[Finnish Game Fish. Res. Inst., Fish. Div., P.O. Box 193, SF-00131 Helsinki 13, Finland]

## POPULATION STUDIES, PRODUCTION, RECRUITMENT, ETC. (CONTINUED)

82-000870 Parmanne, R. and V. Sjöblom. ABUNDANCE OF SPRAT EGGS AND LARVAE IN THE NORTHERN BALTIC IN 1980. *Int. Counc. Explor. Sea*. C.M. 1981/J:24. 7p. 1981. In English with French summ. SFA 27(2)
[Finnish Game Fish. Res. Inst., Fish. Div., P.O. Box 193, SF-00131 Helsinki 13, Finland]

82-000871 Sjöblom, V. and R. Parmanne. ABUNDANCE AND RECRUITMENT OF BALTIC HERRING AND SPRAT OFF THE COAST OF FINLAND IN 1956-68 AND 1975-80 ACCORDING TO EXPLORATORY FISHING WITH A PELAGIC TRAWL. *Int. Counc. Explor. Sea*. C.M. 1981/J:25. 15p. 1981. In English with French summ. SFA 27(2)
[Finnish Game Fish. Res. Inst., Fish. Div., P.O. Box 193, SF-00131 Helsinki 13, Finland]

82-000872 Solomon, G.; K. Matsushita; M. Shimizu and Y. Nose. THE FLUCTUATION AND DISTRIBUTION OF THE POPULATION DENSITY AND FISH MOVEMENT OF ROSE BITTERLING IN SHIN TONE RIVER. *Bull. Jpn. Soc. Sci. Fish*. 48(1):1-9. Jan. 1982. SFA 27(2)
[Dep. Fish., Fac. Agric., Univ. Tokyo, Bunkyo, Tokyo 113, Japan]

82-000873 Suuronen, P. FLUCTUATIONS OF COD OFF THE FINNISH COAST IN 1976-80 ON THE BASIS OF THE BY-CATCH OF COD IN HERRING TRAWLS. *Int. Counc. Explor. Sea* C.M. 1981/J:26. 6p. 1981. In English with French summ. SFA 27(2)
[Finnish Game Fish. Res. Inst., Fish Div., P.O. Box 193, SF-00131 Helsinki 13, Finland]

82-000874 Waters, T. F. ANNUAL PRODUCTION BY A STREAM BROOK CHARR POPULATION AND BY ITS PRINCIAL INVERTEBRATE FOOD. *Environ. Biol. Fishes* 7(2):165-170. 15 Mar. 1982. SFA 27(2)
[Dep. Entomol. Fish Wildl., Univ. Minn., St. Paul 55108] Annual production by the brook charr (*Salvelinus fontinalis*) population in Valley Creek, Minnesota, over the five-year period 1968-1972, was closely correlated to production by its main invertebrate food, *Gammarus pseudolimnaeus*, which had been reduced by siltation. Annual production was 163-191 kg ha-$^{1}$ (wet weight) in 1968-1969, respectively, and then dropped to a minimum of 79 kg ha-$^{1}$ in 1971, the year most seriously affected by decreased invertebrate production and siltation; year-class strength, standing stock, and total year-class (cohort production followed approximately the same pattern. Total year-class production was highest for the 1968-1969 year classes at 211-178 kg ha-$^{1}$, respectively, and lowest for the 1971 year class 76kg ha-$^{1}$. Annual P/B ratios ranged from 1.0 to 1.9; cohort P/B ratios, for the 1968-1972 year classes, ranged from 5.6 to 7.2.

## SPAWNING HABITS AND MOVEMENTS, FECUNDITY, ETC.

82-000875 Brawn, V. M. BEHAVIOR OF ATLANTIC SALMON (*SALMO SALAR*) DURING SUSPENDED MIGRATION IN AN ESTUARY, SHEET HARBOUR, NOVA SCOTIA, OBSERVED VISUALLY AND BY ULTRASONIC TRACKING. *Can. J. Fish. Aquatic Sci*. 39(2):248-256. Feb. 1982. In English with French summ. SFA 27(2)
[c/o Dr. V.M. Srivastava, 349 Waverley Rd., Dartmouth, NS B2X 2E5, Canada]

82-000876 Carlisle, T. R. THE EVOLUTION OF PARENTAL CARE PATTERNS: A SYNTHESIS AND A STUDY OF THE BREEDING ECOLOGY OF A CICHLID FISH, *AEQUIDENS COERULEOPUNCTATUS*. *Ph.D. dissertation, Univ. Calif. (Santa Barbara)* 207p. 1981. From Diss. Abstr. Int. B Sci. Eng. 42(9):3557. Mar. 1982. SFA 27(2)

## SPAWNING HABITS AND MOVEMENTS, FECUNDITY, ETC. (CONTINUED)

82-000877 Gale, W. F. and G. L. Buynak. FECUNDITY AND SPAWNING FREQUENCY OF THE FATHEAD MINNOW--A FRACTIONAL SPAWNER. *Trans. Am. Fish. Soc.* 111(1):35-40. Jan. 1982. SFA 27(2)
[Ichthyological Assoc., Inc., R.D. 1, Berwick, PA 18603]

82-000878 Garrett, G. P. VARIATION IN REPRODUCTIVE STRATEGY IN THE PECOS PUPFISH, *CYPRINODON PECOSENSIS*. *Ph.D. dissertation, Univ. Tex.* 209p. 1981. From Diss. Abstr. Int. B Sci. Eng. 42(7):2734. Jan. 1982. SFA 27(2)

The reproductive strategies of three populations of *Cyprinodon pecosensis* were assessed and compared. Two of the populations occurred on the Bitter Lake Wildlife Refuge, New Mexico in extremely different environments. These were studied in situ from 1977 to 1979 and experimentally in 1979 and 1980. The third population came from Salt Creek, a tributary of the Pecos River, in Texas and was used primarily for experimental populations. All three populations were found to differ greatly in their reproductive strategies. One of the populations from the Bitter Lake Refuge was located in a small, environmentally stable sinkhole. The population was relatively dense and competition was assumed to be high. The other population occurred in a large artificial impoundment that experienced extreme changes in water level. This population was also subject to predation by piscivorous fishes and waterfowl. In contrasting these two populations, members of the sinkhole poplation were found to mature at a larger size and live longer. Females of this population had smaller ovaries, produced fewer, larger eggs and were heavier bodied. Over the three year study period these parameters varied within each population, but, the differences were not as great as the interpopulational difference. Experimental manipulations showed all three populations possessed equivalent abilities for variation of every parameter except egg size. Egg size was also varied but each population appeared to have different upper and lower limits.

82-000879 Honda, H. ON THE FEMALE SEX PHEROMONES AND COURTSHIP BEHAVIOUR IN THE BITTERLINGS *RHODEUS OCELLATUS OCELLATUS* AND *ACHEILOGNATHUS LANCEOLATUS*. *Bull. Jpn. Soc. Sci. Fish.* 48(1):43-45. Jan. 1982. SFA 27(2)
[Bio-Environ. Lab., Cent. Res. Inst. Elec. Power Ind., Abiko, Chiba 270-11, Japan]

82-000880 Honda, H. ON THE FEMALE SEX PHEROMONES AND COURTSHIP BEHAVIOUR IN THE SALMONIDS, *ONCORHYNCHUS MASOU* AND *O. RHODURUS*. *Bull. Jpn. Soc. Sci. Fish.* 48(1):47-49. Jan. 1982. SFA 27(2)
[Bio-Environ. Lab., Cent. Res. Inst. Elec. Power Ind., Obiko, Chiba 270-11, Japan]

82-000881 Hourston, A. S.; H. Rosenthal and H. von Westernhagen. CONDITION AT HATCHING OF PACIFIC HERRING LARVAE FROM NATURAL AND ARTIFICIAL SPAWN OF DIFFERENT INTENSITIES ON A VARIETY OF SUBSTRATES. *Can. Tech. Rep. Fish. Aquatic Sci.* No. 1045. v + 25p. Dec. 1981. In English with French and German summ. SFA 27(2)

[Dep. Fish Oceans, Resour. Serv. Br., Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada] Herring eggs spawned naturally and artificially (from large and small fish) in 53 combinations of 14 different substrates at 5 different intensities were incubated in the laboratory at 8±1°C and 25±1 $^{o}$/oo salinity. Hatching occurred mainly 16-19 days after fertilization, producing larvae 7.6 to 9.1 mm in length with a dry weight of between .118 and .169 mg, a yolk volume of .267-.075 mm$^3$ and a condition factor of .337 to .195. Incubation period decreased as spawning intensity increased and tended to peak over a shorter period for the later hatches (lighter spawn). Average length at hatching increased with the duration of the incubation period,

## SPAWNING HABITS AND MOVEMENTS, FECUNDITY, ETC. (CONTINUED)

82-000881 CONTINUED dropping off temperarily immediately after the peak of hatching, then rising again before showing a second drop towards the end of the hatching period. Average weight, yolk volume and condition factor all showed trends opposite to those for average length. Data for hatchings from natural spawn showed greater variability than did data for artificial spawn but there were no apparent differences in the hatch from artificial spawn of large and small fish. The hatch from different substrates showed some differences in incubation period and related factors but this may have mainly reflected differences in spawn intensity between substrates.

82-000882 Kepner, W. G. REPRODUCTIVE BIOLOGY OF LONGFIN DACE (*AGOSIA CHRYSOGASTER*) IN A SONORAN DESERT STREAM, ARIZONA. *M.S. thesis, Ariz. State Univ.* 78p. May 1982. SFA 27(2)
The longfin dace, *Agosia chrysogaster* Girard, is the most abundant native minnow of low elevation (< 1,500 m) streams in Arizona, parts of southwestern New Mexico, and northern Mexico. Reproductive life history of longfin dace was examined over a 12-month period (1977-78) in Aravaipa Creek, Graham and Pinal counties, Arizona. Adult males and females are sexually dimorphic, clearly distinguishable by differences in size of fins. Gravid females and tuberculate males persisted throughout the year and spawned in shallow saucer-shaped depressions in sand-bottomed backwaters and runs. Although individual spawning activity was asynchronous, populations reached peak spawning conditon at least twice within the year. Peak reproductive activity was during increased discharge in spring and late summer. Fecundity was primarily a function of size. Ovary weight was highly correlated with fecundity and was the most reliable indicator of total mature ova produced.

82-000883 Kodric-Brown, A. EFFECT OF POPULATION DENSITY ON THE BREEDING SYSTEM OF *CYPRINODON PECOSENSIS*. *Proc. Desert Fishes Counc.* 12:94-95. 1980(1981). In English and Spanish. Abstract only. SFA 27(2)
[Univ. Ariz., Tucson]

82-000884 Leslie, A. J., Jr.; J. M. Van Dyke; L. E. Nall and W. W. Miley II. CURRENT VELOCITY FOR TRANSPORT OF GRASS CARP EGGS. *Trans. Am. Fish. Soc.* 111(1):99-101. Jan. 1982. SFA 27(2)
[Fla. Dep. Nat. Resour., 3900 Commonwealth Blvd., Tallahassee 32303]

82-000885 Merrick, J. R. and H. S. Midgley. SPAWNING BEHAVIOUR OF THE FRESHWATER CATFISH *TANDANUS TANDANUS* (PLOTOSIDAE). *Aust. J. Mar. Freshwater Res.* 32(6):1003-1006. 1981. SFA 27(2)
[Sch. Biol. Sci., Macquarie Univ., North Ryde, N.S.W. 2113, Australia]

82-000886 Mitchell, D. F. EFFECTS OF WATER LEVEL FLUCTUATION ON REPRODUCTION OF LARGEMOUTH BASS, *MICROPTERUS SALMOIDES*, AT MILLERTON LAKE, CALIFORNIA, IN 1973. *Calif. Fish Game* 68(2):68-77. Apr. 1982. SFA 27(2)
[Calif. Dep. Fish Game, 1234 E. Shaw Ave., Fresno 93710] Water level fluctuation was evaluated as a limiting factor to largemouth bass, *Micropterus salmoides*, nesting success at Millerton Lake, Madera and Fresno counties. Spawning behavior, nesting success, and associated physical parameters were examined during reservoir drawdown and refilling in 1973. Reproduction was adversely impacted by rising water levels, through temperature reduction, and by lowering water levels, through nest destruction. Successful nesting was observed only during periods of water stability in March and June. Where springtime water level manipulation is an essential part of reservoir operation, staged drawdowns are recommended to minimize impact on largemouth bass nesting. Methods for determining criteria for reservoir operation are described.

## SPAWNING HABITS AND MOVEMENTS, FECUNDITY, ETC. (CONTINUED)

82-000887 Moodie, G. E. E. and M. Power. THE REPRODUCTIVE BIOLOGY OF AN ARMOURED CATFISH, *LORICARIA URACANTHA*, FROM CENTRAL AMERICA. *Environ. Biol. Fishes* 7(2):143-148. 15 Mar. 1982. SFA 27(2)
[Dep. Biol., Univ. Winnipeg, Winnipeg, MB R3B 2E9, Canada] The reproductive biology of one of the poorly known armoured catfishes, *Loricaria uracantha*, was studied in Panama. Natural nesting sites consisted of cavities in pieces of wood, open at both ends and positioned above the stream bottom, but artificial cavities of PVC pipe were readily used. Males possess bony bristles on the head and pectoral fins which contact the female prior to oviposition. Males spawned with up to five females in short succession and remained with the eggs until hatching. Following hatching many initiated another spawning cycle. One male was reproductively active for 73 days during which it completed five distinct reproductive cycles. Spawning extended throughout the year.

82-000888 Scott, D. B. C. THE REPRODUCTIVE BIOLOGY OF *OSTEOGLOSSUM BICIRRHOSUM* VANDELLI (OSTEICHTHYES, OSTEOGLOSSIDAE) IN AMAZONAS. *Natl. Geogr. Soc. Res. Rep.* 13:221-230. 1981. SFA 27(2)
[Univ. St. Andrews, Fife, Scotland]

82-000889 Sutterlin, A. M.; R. L. Saunders; E. B. Henderson and P. R. Harmon. THE HOMING OF ATLANTIC SALMON (*SALAR SALAR*) TO A MARINE SITE. *Can. Tech. Rep. Fish. Aquatic Sci.* No. 1058. iii + 6p. Jan. 1982. In English with French summ. SFA 27(2)
[Biol. Stn., St. Andrews, NB E0G 2X0, Canada] Atlantic salmon (*Salmo salar*) smolts reared in a distant hatchery and released at a marine site 12 km from their parent stream returned to the marine site after having spent from 13-25 mo at sea. A group of smolts chemically imprinted in salt water with morpholine and retained 2-3 wk while being fed a high fat, high protein diet, had the highest return rate. It is suggested that salmon smolts can be imprinted in the marine environment to natural and/or synthetic cues, but data are insufficient to separate effects due to imprinting, nutrition, smolt size, and delayed release on ocean survival and homing. Returning salmon remained within 2 km of the release site for a period of 2 mo until many of of them were captured. Returning grilse had ceased feeding by August 1 and were periodically captured near the release site throughout the summer and fall, during which time a progressive decrease in weight (0.26%/day), condition factor and flesh palatability occurred.

82-000890 Tribble, G. W. SOCIAL ORGANIZATION, PATTERNS OF SEXUALITY, AND BEHAVIOR OF THE WRASSE *CORIS DORSOMACULATA* AT MIYAKE-JIMA, JAPAN. *Environ. Biol. Fishes* 7(1):29-38. 15 Jan. 1982. SFA 27(2)
[4074 Puu Eleele Pl, Honolulu, HI 96816]

## MOVEMENTS, SEASONAL AND DEPTH DISTRIBUTION, ETC.

82-000891 Buck, R. J. G. and A. F. Youngson. THE DOWNSTREAM MIGRATION OF PRECOCIOUSLY MATURE ATLANTIC SALMON, *SALMO SALAR* L, PARR IN AUTUMN; ITS RELATION TO THE SPAWNING MIGRATION OF MATURE ADULT FISH. *J. Fish Biol.* 20(3):279-288. Mar. 1982. SFA 27(2)
[D.A.F.S., Freshwater Fish. Lab., Pitlochry, Scotland] The autumn emigration of juvenile Atlantic salmon, *Salmo salar* L. from the Girnock Burn, Aberdeenshire, is shown to be comprised of two components. Precociously mature males and sexually immature fish differ in their dependence on seasonal and biological cues for the release of migratory behaviour. The emigration of ripe mature male parr is shown to follow the entry of mature adult salmon to the stream; when adult fish are prevented from entering the stream, the emigration is induced by seasonal factors. Spent male parr tend

MOVEMENTS, SEASONAL AND DEPTH DISTRIBUTION, ETC. (CONTINUED)

82-000891 CONTINUED not to participate in the autumn emigration. The emigration is considered to be principally an appetitive phenomenon which maximized the number of precociously mature males attaining sexual contact with adults.

82-000892 Gilmore, R. G. and C. J. Donohoe. DIEL VARIATION IN SEAGRASS BED FISH POPULATIONS. *Fla. Sci.* 45(suppl. 1):27. 1982. Abstract only. SFA 27(2)
[Harbor Branch Found., Rt. 1, Box 196, Ft. Pierce, FL 33450]

82-000893 Henley, D. T. and R. L. Applegate. SEASONAL DISTRIBUTION OF ESOCIDS IN A POWER PLANT COOLING RESERVOIR. *Prog. Fish-Cult.* 44(1):40-41. Jan. 1982. SFA 27(2)
[Ohio Dep. Nat. Resour., Akron 44314]

82-000894 Kendall, A. W., Jr. and N. A. Naplin. DIEL-DEPTH DISTRIBUTION OF SUMMER ICHTHYOPLANKTON IN THE MIDDLE ATLANTIC BIGHT. *NOAA Fish. Bull.* 79(4):705-726. Oct. 1981. SFA 27(2)
[NMFS, 2725 Montlake Blvd. East, Seattle, WA 98112]

82-000895 Kulka, D. W. and W. T. Stobo. WINTER DISTRIBUTION AND FEEDING OF MACKEREL ON THE SCOTIAN SHELF AND OUTER GEORGES BANK WITH REFERENCE TO THE WINTER DISTRIBUTION OF OTHER FINFISH SPECIES. *Can. Tech. Rep. Fish. Aquatic Sci.* No. 1038. iv + 38p. Aug. 1981. In English with French summ. SFA 27(2)
[Bedford Inst. Oceanogr., Dartmouth, NS B2Y 4A2, Canada]

82-000896 Lux, F. E. and F. E. Nichy. MOVEMENTS OF TAGGED SUMMER FLOUNDER, *PARALICHTHYS DENTATUS*, OFF SOUTHERN NEW ENGLAND. *NOAA Tech. Rep. NMFS SSRF* 752. iii + 16p. Dec. 1981. SFA 27(2)
[Northeast Fish. Cent. Woods Hole Lab., NMFS, Woods Hole, MA 02543] A total of 2,839 summer flounder were tagged on outer continental shelf and coastal grounds off southern New England in 1961-62. Tag recaptures showed the migration to offshore grounds in fall and winter and to inshore areas in spring and summer. Recaptures from coastal grounds were recorded from northern New Jersey to south of Cape Cod; those from outer shelf grounds were from Baltimore Canyon on the southwest to Veatch Canyon on the northeast. The overall tag return rate was 21.2%; however, the returns from inshore tagging (44.5%) were much higher than those from offshore releases (8.4%), suggesting that tagging mortality was higher offshore.

82-000897 Nieman, D. A. and M. D. Clady. WINTER MOVEMENT OF FLORIDA AND NORTHERN LARGEMOUTH BASS NEAR A HEATED EFFLUENT. *Proc. Annu. Conf. Southeast. Assoc. Fish. Wildl. Agencies* 34:11-18. 1980[1981]. SFA 27(2)
[RMC-Ecol. Div., R.D. 1, Pottstown, PA 19464] Winter home ranges and movements of northern and Florida largemouth bass (*Micropterus salmoides salmoides* and *M. s. floridanus*) in a heated cove of Boomer Lake, Oklahoma, were estimated by using ultrasonic telemetry. Within the heated cove, individuals of both subspecies (3 northern, 2 Florida) occupied home ranges that appeared to be related to the distribution of heated water, cover, current, depth, and food. Other fish of both subspecies left the heated cove and did not return. No periodic migrations into or out of the heated cove were observed, although tagged bass frequently moved among several limited areas of cover within the cove. No clear behavioral differences between subspecies were found that might explain the lower over-winter survival of Florida largemouth bass in Boomer Lake, but it appeared that mortality was not due solely to low temperature.

## MOVEMENTS, SEASONAL AND DEPTH DISTRIBUTION, ETC. (CONTINUED)

82-000898 Pollock, B. R. MOVEMENTS AND MIGRATIONS OF YELLOWFIN BREAM, *ACANTHOPAGRUS AUSTRALIS* (GÜNTHER), IN MORETON BAY, QUEENSLAND AS DETERMINED BY TAG RECOVERIES. *J. Fish Biol.* 20(3):245-252. Mar. 1982. SFA 27(2)
[Queensland Fish. Serv., Transport House, Fortitude Valley, Queensland, Australia] Yellowfin bream were tagged and released in three non-spawning areas and two spawning areas in Moreton Bay, a large estuarine system on the east coast of Australia. A total of 194 fish were recaptured. Juvenile fish made only small-scale movements (less than 6 km) from the release site. Small-scale movements were also recorded for adult fish, although large-scale movements from 10 to 90 km were also recorded. The large-scale movements appear to be associated with the migration of adult fish to or from surf bar spawning areas. Some adult fish remained in feeding areas during the spawning season (May-August). There was no indication from tag recoveries of any movements of yellowfin bream outside Moreton Bay and the results indicate that adult yellowfin bream in Moreton Bay may be regarded as a unit stock for the purpose of fisheries management.

82-000899 Rinne, J. N. and B. Wanjala. OBSERVATIONS ON MOVEMENT PATTERNS OF *TILAPIA* SPP. IN NYANZA GULF, LAKE VICTORIA, EAST AFRICA. *J. Fish Biol.* 20(3):317-322. Mar. 1982. SFA 27(2)
[U.S. For. Serv., For. Sci. Lab., Ariz. State Univ., Tempe 85287]

82-000900 Robertson, D. R. and S. A. Foster. OFF-REEF EMIGRATION OF YOUNG ADULTS OF THE LABRID FISH *EPIBULUS INSIDIATOR*. *Copeia* 1982(1):227-229. 23 Feb. 1982. SFA 27(2)
[Smithsonian Trop. Res. Inst., Box 2072, Balboa, Panama]

## FOODS/FEEDING

82-000901 Ajayi, T. O. FOOD AND FEEDING HABITS OF *RAJA* SPECIES (BATOIDEI) IN CARMARTHEN BAY, BRISTOL CHANNEL. *J. Mar. Biol. Assoc. U.K.* 62(1):215-223. Feb. 1982. SFA 27(2)
[Nigerian Inst. Oceanogr. Mar. Res., Victoria Island, P.M.B. 12729, Lagos, Nigeria] The food preferences of three rays, *Raja clavata* L., *R. microocellata* Montague and *R. montagui* Fowler were studied in Carmarthen Bay, South Wales. Within each species the size groups to a large extent preyed on different items. Between species, diets of *R. clavata* and *R. montagui* were the most similar. Crustaceans, mainly shrimps and crabs, were important to all three. Fish, though also consumed by *R. clavata* and *R. montagui* were the predominant food of larger *R. microocellata*. Cannabalism occurred occasionally.

82-000902 Bagge, P. and L. Hakkari. THE FOOD AND PARASITES OF FISH IN SOME DEEP BASINS OF NORTHERN L. PÄIJÄNNE. *Hydrobiologia* 86(1-2):61-65. 16 Jan. 1982. SFA 27(2)
[Hydrobiol. Res. Cent., Univ. Jyväskylä, SF-40100 Jyväskylä 10, Finland]

82-000903 Bahuguna, S. N. and H. R. Singh. FOOD AND FEEDING HABITS OF A HILLSTREAM FISH, *GLYPTOTHORAX PECTINOPTERUM* (MC CLELLAND). *Indian J. Anim. Sci.* 51(10):964-967. 1981. SFA 27(2)
[Garhwal Univ., Sringager Garhwal, Uttar Pradesh 246 174, India] The paper presents an account of the food and feeding habits of *Glyptothorax pectinopterum* (Mc Clelland) collected from the Garhwal hillstreams. It is a

## FOODS/FEEDING (CONTINUED)

82-000903 CONTINUED bottom feeder fish subsisting on insects and crustaceans. The feeding intensity attains two peaks in a year, the first in February-March and the second in November. The change in feeding intensity appears to be correlated with the availability of food items in nature.

82-000904 Bohnsack, J. A. CORAL REEF FISH COMMUNITIES: EFFECTS OF PREDATOR REMOVAL. *Fla. Sci.* 45(suppl. 1):27. 1982. Abstract only. SFA 27(2)
[Coop. Inst. Mar. Atmos. Sci., Univ. Miami, 4600 Rickenbacker Causeway, Miami, FL 33149] The hypothesis that piscivorous predators control coral reef fish community structure was experimentally tested in the Florida Keys. Random visual censuses were made for one year on large control and experimental reefs. The experimental reef, Looe Key Reef, has been continually exploited by heavy spearfishing pressure which is particularly effective at removing the top predators. Control reefs in the Key Largo Coral Reef Preserve have been protected from spearfishing since 1960. Data show significantly fewer piscivorous predators present on the experimental reef, although one grouper, *Epinephelus cruentatus*, normally too small to spear, appeared to show some density compensation. Several non-piscivorous predator species showed significant abundance differences between experimental and control reefs. More rigorous testing of the hypothesis is currently underway.

82-000905 Coates, L. J.; J. C. Roff and D. F. Markle. FRESHWATER COMPONENTS IN THE DIET OF THE MARINE NEUSTONIC FISH, *UROPHYCIS TENUIS* (MITCHILL). *Environ. Biol. Fishes* 7(1):69-72. 15 Jan. 1982. SFA 27(2)
[Dep. Zool., Coll. Biol. Sci., Univ. Guelph, Guelph, ON N1G 2W1, Canada] Stomach content analysis of a neustonic marine juvenile white hake (*Urophycis tenius* (Mitchill)), revealed the presence of a unusual 0.70mm bolus, consisting of a freshwater rotifer, *Keratella cochlearis*, and several species of freshwater phytoplankton; *Asterionella formosa*, *Melosira granulata*, *Dinobryon bavaricum* and *Dinobryon cylindricum*. Other gut items were typical for the predator during the August period, consisting of various stages of marine calanoid copepods and cladocerans; average prey length was 0.74mm. The possibility of bolus introduction as a secondary diet component was eliminated; evidence indicated that the particle was ingested in toto. Consideration of a number of alternative mechanisms for bolus acquisition led to the conclusion that the bolus was disseminated via the ballast tank or contaminated freshwater holding tank of a ship. *Urophycis tenuis* appears to feed selectively on the basis of particle size. Consequently, this type of neustonic predator may be particularly vulnerable to man-made pollution and oil spills.

82-000906 Crist, L. DISTRIBUTION AND FOOD HABITS OF LEAST CHUB (*IOTICHTHYS PHLEGETHONTIS*) IN A SPRING-MARSH COMPLEX IN WESTERN UTAH. *Proc. Desert Fishes Counc.* 12:77-78. 1980(1981). In English and Spanish. Abstract only. SFA 27(2)
[Bio/West, Inc., Logan, UT 84321]

82-000907 Drenner, R. W.; W. J. O'Brien and J. R. Mummert. FILTER-FEEDING RATES OF GIZZARD SHAD. *Trans. Am. Fish. Soc.* 111(2):210-215. Mar. 1982. SFA 27(2)
[Dep. Biol., Tex. Christian Univ., Fort Worth, TX 76129]

82-000908 Drenner, R. W.; G. L. Vinyard; M. Gophen and S. R. McComas. FEEDING BEHAVIOR OF THE CICHLID, *SAROTHERODON GALILAEUM*: SELECTIVE PREDATION ON LAKE KINNERET ZOOPLANKTON. *Hydrobiologia* 87(1):17-20. 12 Feb. 1982. SFA 27(2)
[Dep. Biol., Tex. Christian Univ., Ft. Worth 76129] In laboratory feeding trials, we analyzed the feeding behavior and selectivity of the cichlid,

## FOODS/FEEDING (CONTINUED)

82-000908 CONTINUED *Sarotherodon galilaeum*, for zooplankton prey from Lake Kinneret, Israel. The feeding behavior was dependent on fish size. Fish less than 20mm SL fed on zooplankton as obligate particulate feeders. Fish from 20 to 42mm SL fed either as particulate feeders or as filter feeders. Fish larger than 62mm SL fed as obligate filter feeders. Particulate-feeding fish were size selective and had highest feeding electivities for large-size zooplankton species. Filter-feeding fish had highest feeding electivities for zooplankton species with poor escape ability. In general, *S. galilaeum* predation pressure would be greatest on *Ceriodaphnia reticulata*, a large-bodied and easily captured species which is selected by both particulate-feeding and filter-feeding fish.

82-000909 Ellertsen, B.; H. Loeng; F. Rey and S. Tjelmeland. "LODDA PÅ SOMMERBEITE". FELTOBSERVASJONER I 1979 OG 1980. [THE FEEDING CONDITIONS OF CAPELIN DURING SUMMER. FIELD OBSERVATIONS IN 1979 AND 1980.] *Fisken Havet* 1981(3):1-68. 1981. In Norwegian with English summ. SFA 27(2)
[Havforskningsinst., Bergen, Norway]

82-000910 Fagade, S. O. THE FOOD AND FEEDING HABITS OF *SAROTHERODON GALILAEUS* FROM A SMALL LAKE. *Arch. Hydrobiol.* 93(2):256-263. 1982. In English with German summ. SFA 27(2)
[Dep. Zool., Univ. Ibadan, Ibadan, Nigeria] The results of detailed qualitative and quantitative analyses of food found in the gut of *Sarotherodon galilaeus* are provided. It is shown that averagely the food in the full stomachs constitute 0.55% of the body weight while food in the intestine consititute 1.65% of the body weight. Information on the dry weight of food in relation to body weight is also provided. The food items encountered in the gut covers a wide spectrum. The species is shown to feed on a wider variety of plant materials than animals. The dominant plants include pennate and centric diatoms and an assortment of unicellular, colonial and filamentous algae. In addition the species also feed on a wide range of animals. These include protozoans, bryozoan colony, rotifers, copepods, ostracods, cladocerans, insect larvae and pupae, arthropod appendages and gastropods. The food items found in the stomachs and intestines are shown to have slight differences. The labile food habits is discussed in relation to the success of the species in the small lake at the International Institute of Tropical Agriculture (IITA).

82-000911 Gabriel, W. L. and W. G. Pearcy. FEEDING SELECTIVITY OF DOVER SOLE, *MICROSTOMUS PACIFICUS*, OFF OREGON. *NOAA Fish. Bull.* 79(4):749-763. Oct. 1981. SFA 27(2)
[Fish. Prog., Dep. For. Wildl. Manage., Univ. Mass., Amherst 01003]

82-000912 Ghion, F. VERIFICA SPERIMENTALE DELLA SELEZIONE DIMENSIONALE OPERATA DAI CEFALI SULLA BASE ALIMENTARE. [EXPERIMENTAL CONTROL OF FOOD SIZE SELECTION IN MULLETS.] *Riv. It. Piscic. Ittiop.* 16(4):122-125. Oct.-Nov.-Dec. 1981. In Italian with English summ. SFA 27(2)
[Cent. Ittiol. Valli Venete Cà Pisani-Cà Venice (RO), Italy]

82-000913 Hacunda, J. S. TROPHIC RELATIONSHIPS AMONG DEMERSAL FISHES IN A COASTAL AREA OF THE GULF OF MAINE. *NOAA Fish. Bull.* 79(4):775-788. Oct. 1981. SFA 27(2)
[Grad. Sch. Oceanogr., Univ. R.I., Kingston 02881]

FOODS/FEEDING (CONTINUED)

82-000914 Harada, K.; H. Maéda and K. Kobayashi. [APPLICATION OF LOGISTIC CURVE AS AN INDEX OF THE ATTRACTIVE EFFECT OF FOOD FOR ORIENTAL WEATHERFISH.] *Bull. Jpn. Soc. Sci. Fish.* 48(1):21-29. Jan. 1982. In Japanese with English summ. SFA 27(2)
[Shimonoseki Univ. Fish., Yoshimi, Shimonoseki 759-65, Japan]

82-000915 Hourston, A. S.; H. Rosenthal and S. Kerr. CAPACITY OF JUVENILE PACIFIC HERRING (*CLUPEA HARENGUS PALLASI*) TO FEED ON LARVAE OF THEIR OWN SPECIES. *Can. Tech. Rep. Fish. Aquatic Sci.* No. 1044. v + 9p. Dec. 1981. In English with French and German summ. SFA 27(2)
[Dep. Fish. Oceans, Resour. Serv. Br., Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada] Juvenile Pacific herring in the juvenile stage were observed to feed on newly hatched larvae of their own species when the two occur concomitantly. In order to assess the capacity of juvenile herring to consume herring larvae, ten juveniles were fed to satiation in laboratory tanks for 2-6h during each of 3 consecutive days. Individual fish were observed for a period of 1 min and the number of larvae consumed was counted. During the first feeding experiment, individual juveniles consumed an average of 17 larvae per min during the first 20 min: consumption dropped to 8 per min during the next 20 min, after which the satiated juveniles consumed an average of only 1.6 larvae per min. Two subsequent experiments produced similar results, except that the first 20 min stage was bypassed (presumably the juveniles were less hungry) and the pre-satiation feeding rate was only 4 larvae per min. Following a longer period without feeding, a fourth experiment was conducted in which the initial 10 min feeding stage was compared to that observed in the first experiment. Separate observations during the third experiment on 6 larger fish showed that they consumed two-thirds more larvae than did 4 smaller fish. The implications of such cannibalism on natural stocks of larval herring are discussed.

82-000916 Howick, G. L. THE TACTICAL FEEDING ECOLOGY OF LARGEMOUTH BASS (*MICROPTERUS SALMOIDES*). *Ph.D. dissertation, Univ. Kans.* 70p. 1981. From Diss. Abstr. Int. B Sci. Eng. 42(8):3102. Feb. 1982. SFA 27(2)
The predation cycle was used as a conceptual framework to design laboratory experiments to analyze pescivory by largemouth bass. The probability of prey location under various conditions was examined by measuring reaction distance (RD). Reaction distance was always found to be linearly related to prey length, however the exact relationship was dependent on prey species, movement of prey and light intensity. Small minnows and bluegills elicited similar RD's but large minnows elicited greater RD's than the same sized bluegills. Simulated swimming of prey increased RD only to the smaller prey sizes. This is explained by the shorter RD of the smaller prey which gives them a greater angular velocity at the point of reaction. Decreasing light intensity did not effect RD until it dropped below 5 lux. Probability of pursuit was analyzed with binary choice experiments. When offered a choice of two stationary prey, bass usually selected the closer prey unless the farther prey appeared larger by 0.5 degrees of visual angle. If the prey choice was between a stationary and a moving prey, the moving prey had an increased probability of being pursued. Handling time was exponentially related to prey length. Attack success appeared to be exponentially related to prey length, however there was considerable variation within prey size classes. The distance at which bluegill sunfish reacted to an oncoming bass (startle distance) was measured. Bluegill length did not affect startle distance (SD). However, it appeared that SD was linearly related to bass length. There was a corresponding decrease in SD with decreasing light intensity. As a result, bluegill SD was greater than bass RD for most sizes of bluegills at high light intensity. This situation was reversed at low light intensities. This suggests that bass have a tactical advantage at low light intensities. This may be the selective advantage for the evolution of crepuscular feeding by bass.

## FOODS/FEEDING (CONTINUED)

82-000917 Hyatt, K. D. MECHANISMS OF FOOD RESOURCE PARTITIONING AND THE FORAGING STRATEGIES OF RAINBOW TROUT (*SALMO GAIRDNERI*) AND KOKANEE (*ONCORHYNCHUS NERKA*) IN MARION LAKE, BRITISH COLUMBIA. *Ph.D. dissertation, Univ. British Columbia* 1980. From Diss. Abstr. Int. B Sci. Eng. 42(7):2678. Jan. 1982. SFA 27(2)

The acquisition of relatively large, rare prey by trout is promoted by: a tendency to occupy littoral and benthic habitats, procedures for area-extensive search; a predisposition to attach large, armoured prey; large mouth size; persistent responses to opportunities to attack large prey; an inability to maintain high attack rates on small prey at high densities and a tendency to ignore or reject such prey. The acquisition of relatively small but abundant prey by kokanee is promoted by: a tendency to occupy limnetic and water-column habitats; a predisposition to attack relatively small, morphologically uniform prey; small mouth size; well developed gill-rakers; an ability to sustain high attack rates on small planktonic prey; low ingestion success with various large, benthic prey and a tendency to ignore or reject such prey. I conclude that the intimately related sets of traits that control food-resource partitioning by trout and kokanee represent mutually exclusive foraging strategies that have been shaped as evolutionary responses to specific features of a given habitat-prey complex.--From abstr.

82-000918 Jacob, S. S. and N. B. Nair. FOOD AND FEEDING HABITS OF THE LARVIVOROUS FISH *APLOCHEILUS LINEATUS* (CUV. & VAL.) IN ITS NATURAL HABITAT. *J. Fish Biol.* 20(3):329-339. Mar. 1982. SFA 27(2)

[Dep. Aquatic Biol. Fish., Univ. Kerala, Trivandrum 695007, India] Results are presented of a study of the food and feeding habits of *Aplocheilus lineatus* under natural conditions and the manner in which dietary preferences are influenced by the habitat/environment, seasons and stage of maturity of the fish is explained, based on data from monthly random samples collected for a year. A qualitative assessment of the diet reveals that it is not confined to a varied range of aquatic fauna, but also encompases allochthonous fauna. Quantitative and qualitative analyses of the diet indicate its feeding habit which does not alter with size or seasonal changes. The range of prey consumed does not differ radically, qualitatively, as a function of size, but quantitatively exhibits five levels of discrimination and differential exploitation related mainly to prey size. Seasonal fluctuations in feeding are more qualitative than quantitative and seem dependent on the occurrence of food organisms. The lack of correlation between breeding and feeding is linked to extent of the development of the gonad in the body cavity. In conclusion, the potential of the fish as an effective biological control agent of mosquito larvae is indicated by the fact that dipteran larvae are a preferred item of its diet in all size groups.

82-000919 Jacob, S. S.; N. B. Nair and N. K. Balasubramanian. INFLUENCE OF CERTAIN ENVIRONMENTAL FACTORS ON THE PREDATORY EFFICIENCY OF THE LARVICIDAL FISH, *APLOCHEILUS LINEATUS* (CUV. & VAL.). *Arch. Hydrobiol.* 93(3):341-351. 1982. In English with German summ. SFA 27(2)

[Dep. Aquatic Biol. Fish., Univ. Kerala, Trivandrum 695007, India] The assessment of the degree to which environmental factors affect predatory efficiency of the larvicidal fish *Aplocheilus lineatus* reveals that predation is dependent in a quantifiable way on the variables of the environmental complex surrounding the prey-predator system. Predation rate is minimal at low temperatures and increases at a statistically significant rate with rise in temperature. Feeding under conditions of light is significantly higher than in darkness. Salinities of up to $21.83\,^{o}/oo$ do not affect predatory efficiency; at this level however, stress conditions lead to a slackening in food intake. Fish size, investigated to aid extrapolation of data, influences predation in that it increases at a statistically significant rate with increase in size of the individual. In terms of unit body weight, predatory efficiency declines as size increases. The time course of predation is not altered regularly or significantly by environmental

FOODS/FEEDING (CONTINUED)

82-000919 CONTINUED factors; haphazard intake subsequent to satiation and/or a "learning" factor may be responsible for this. The potenetial of the fish as a biocontrol agent of mosquito larvae is indicated by the fact that its predatory efficiency is higher than that of the conventional larvivore, *Gambusia affinis*.

82-000920 Keen, W. H. BEHAVIORAL INTERACTIONS AND BODY SIZE DIFFERENCES IN COMPETITION FOR FOOD AMONG JUVENILE BROWN BULLHEAD (*ICTALURUS NEBULOSUS*). *Can. J. Fish. Aquatic Sci.* 39(2):316-320. Feb. 1982. In English with French summ. SFA 27(2)
[Dep. Biol. Sci., State Univ. N.Y., Cortland 13045]

82-000921 Kimura, S. [FEEDING HABIT OF *PARAPRISTIPOMA TRILINEATUM* IN KUMANO-NADA, CENTRAL JAPAN.] *Bull. Jpn. Soc. Sci. Fish.* 47(2):1551-1558. In Japanese with English summ. SFA 27(2)
[Fish. Res. Lab., Mie Univ., Wagu, Shima, Mie 517-07, Japan] The present report deals with the feeding habit of *Parapristipoma trilineatum*, Pomadasyidae, based on 1208 individuals taken from coastal areas of Kumano-nada (Kii Peninsula, central Japan) from March 1978 to September 1980. Empty stomachs occurred more frequently in the samples collected by hook and line than in the samples collected by set net. Feeding activity was intense during the period from May to September, and declined after October. The main food of the immatures and adults, larger than 100 mm in fork length, was clupeoid fishes, but crustaceans were fed on abundantly in March, June, November and December. Clupeoid fishes appeared as prey animal in almost all seasons. Copepods chiefly appeared in spring and autumn, while amphipods in summer. The main food of juveniles, smaller than 50 mm, were copepodid larvae and bivalue larvae. Those of young, 50-100 mm, were *Eucalanus* spp., copepodid larvae, mysis larvae, zoea larvae and clupeoid larvae. Maximum value of αmax (=PLmax/L;l, length of predator; PLmax, maximum size of prey) was 58% in the fish 50-100 mm in fork length. The value of αmax declined with groth for the fish larger than 100 mm.

82-000922 Knight, R. L.; F. J. Margraf and R. F. Carline. PREDATION BY WALLEYE (*STIZOSTEDION VITREUM*) AND YELLOW PERCH (*PERCA FLAVESCENS*) ON FORAGE FISHES IN WESTERN LAKE ERIE. *Ohio J. Sci.* 82(2):98. 1982. Abstract only. SFA 27(2)
[Ohio Coop. Fish. Res. Unit, Ohio State Univ., Columbus 43210] In this study, we documented the food habits of adult walleye (*Stizostedion vitreum*) and yellow perch (*Perca flavescens*) and related diet selection to forage fish availability. Two offshore stations in the Western Basin of Lake Erie were sampled over a 3-year period with bottom trawls and gillnets. We removed stomachs from about 500 walleyes and 1,200 yellow perch, analyzed their contents, and compared these data to the size distribution and relative abundance of their primary prey. Walleye were more piscivorous than yellow perch and did not switch to invertebrates when forage fish abundances were low. Yellow perch were omnivorous and readily converted to an invertebrate diet when forage fishes were less available. Walleye ate yearling shiners (*Notropis* spp.) in spring and early summer, then shifted to gizzard shad (*Dorosoma cepedianum*), alewife (*Alosa pseudoharengus*), and other abundant young-of-year fishes in late summer and early fall. Walleye switched back to shiners in late fall because other fishes were too large. Picivorous yellow perch preferred similar food to walleye but were cannibalistic in some instances. Walleye seldom selected prey greater than 40% of their total length whereas yellow perch occasionally ingested prey more than 50% of their length. Walleye and yellow perch were opportunistic feeders with relative abundance of prey largely determining diet selection. In western Lake Erie, abundance of forage fishes probably influence walleye and yellow perch growth rates.

FOODS/FEEDING (CONTINUED)

82-000923 Kratz, K. and G. L. Vinyard. MECHANISMS OF PREY SELECTIVITY IN THE PIUTE SCULPIN, *COTTUS BELDINGI*. *Cal-Neva Wildl. Trans.* p. 11-18. 1981. SFA 27(2)

[Dep. Biol., Univ. Nevada, Reno 89557] The mechanics of the predation of the sculpin, *Cottus beldingi*, was examined in artificial laboratory stream conditions using three different prey types; *Gammarus lacustris*, *Arcynopteryx californicus*, and *Ephemerella (drunella)*. It was found that encounter probability and capture success were most important in determining the observed prey selectivity. In feeding trials in which all three prey species were present selectivity was highest for *Gammarus* and lowest for *Ephemerella*. This reflects the observed differences in the activity levels of these species.

82-000924 Longval, M. J.; R. M. Warner and S. H. Gruber. CYCLICAL PATTERNS OF FOOD INTAKE IN THE LEMON SHARK *NEGAPRION BREVIROSTRIS* UNDER CONTROLLED CONDITIONS. *Fla. Sci.* 45(1):25-33. 1981. SFA 27(2)

[Rosenstiel Sch. Mar. Atmos. Sci., Univ. Miami, Div. Biol. Living Resour., 4600 Rickenbacker Causeway, Miami, FL 33149] Food intake of lemon sharks was investigated to determine whether hunger and satiation play a role in their behavior. Lemon sharks (*Negaprion brevirostris*) were placed under controlled conditions and given a single 45 min feeding trial each day for 95 da. During a trial the sharks were offered preweighed pieces of fish fillet and rate of feeding was individually monitored. A spectral analysis of the intake data revealed a tendency toward 4-day cycles in amount eaten. We suggest that the 4-day cycle reflects an internally mediated biological rhythm. Thus, appetite varies over time and satiation certainly operates in the behavior of lemon sharks.

82-000925 Malmqvist, B. and C. Brönmark. FILTER FEEDING IN LARVAL *LAMPETRA PLANERI*: EFFECTS OF SIZE, TEMPERATURE AND PARTICLE CONCENTRATION. *Oikos* 38(1):40-46. Jan. 1982. SFA 27(2)

[Dep. Anim. Ecol., Univ. Lund, Ecol. Bldg., S-223 62 Lund, Sweden] The filtration rate of differently sized larval *Lampetra planeri* (Bloch) was estimated experimentally for a set of temperatures ranging from 2.5 to 25°C, and for 9 different food particle concentrations at 15°C. The food material presented consisted of suspended yeast. The concentration was measured indirectly as turbidity. Large larvae had a higher absolute filtration rate than small ones and were less dependent on temperature. If respiration was considered, the most "economic" filtration was achieved below 10°C. This is in accordance with the low mean annual temperature of typical *Lampera planeri* streams. High ratio of filtration to respiration was seen to coincide with maximum food availability of the stream from where the larvae were collected. Low particle concentrations were compensated for by an increased filtration rate. In the interval between 30 and 100 mg dry weight of suspended yeast per litre, larvae increased their rates of filtration. The importance of *Lampetra planeri* larvae in depleting the water of particles was calculated to be minimal. Less than $1.10^{-4}$% of the water passing each metre of stream length was filtered by the lampreys.

82-000926 Mann, R. H. K. THE ANNUAL FOOD CONSUMPTION AND PREY PREFERENCES OF PIKE (*ESOX LUCIUS*) IN THE RIVER FROME, DORSET. *J. Anim. Ecol.* 51(1):81-95. Feb. 1982. SFA 27(2)

[Freshwater Biol. Assoc., River Lab., East Stoke, Wareham, Dorset, England] The annual maintenance coefficient, 0.815 g $g^{-1}yr^{-1}$(95% C.L. 0.260-1.231), and the efficiency of food utilization, 2.167 (95% C.L. 1.193-3.141), were estimated from feeding experiments in flowing-water channels using four adult *Esox lucius*, size range 624-1010g. The annual food consumption of *E. lucius* in the River Frome was estimated to be 151.06kg ha$^{-1}$ (95% C.L. 122.14-207.74). This supported an annual *E. lucius* production of 41.34kg ha$^{-1}$ (95% C.L. 33.42-56.82). The proportion of food used for maintenance by each age-group increased from

## FOODS/FEEDING (CONTINUED)

82-000926 CONTINUED 24.3% at age 1 to 77.5% at age 10 years. *Esox lucius* aged 1 year and older were predominantly piscivorous; less than 1% by weight of their prey were invertebrate animals. Variations in the composition of *E. lucius* diets resulted from changes in the relative influences of prey availability, food selection by *E. lucius*, and the seasonal abundance of prey. Young *E. lucius* ate chiefly *Leuciscus leuciscus*, *Gobio gobio*, *Phoxinus phoxinus*, *Neomacheilus barbatulus* and, in April, migrating *Salmo salar* smolts; larger *E. lucius* ate chiefly *L. leuciscus*, *Salmo trutta*, *Thymallus thymallus*, *Anguilla anguilla* and small *E. lucius*. Cannibalism on *E. lucius* aged between 6 months and 2 years accounted for most of their natural mortality. It is suggested that, in game fisheries, the removal of coarse fish and large *E. lucius* may not always result in increased numbers of salmoids.

82-000927 Matallanas, J. FEEDING HABITS OF *SCYMNORHINUS LICHA* IN CATALAN WATERS. *J. Fish Biol.* 20(2):155-163. Feb. 1982. SFA 27(2)
[Dep. Zool., Auton. Univ. Barcelona, Bellaterra, Barcelona, Spain] A study has been made of the diet of *Scymnorhinus licha* in Catalan coastal waters by means of the analysis of the stomach contents of 97 specimens caught at depths ranging from 300 to 600 metres during a 12 month survey. The annual coefficient of repletion is 80%. Bony fishes form the basic group in the diet for all seasons: they are followed by sharks, crustaceans and cephalopods, which are secondary. As the size of *S. licha* increases, there is an increase in the frequency of crustaceans and sharks in the stomach contents and a drop in the frequency of cephalopods. Bony fishes are slightly more frequent in the larger specimens. The males have a higher coefficient of repletion and a higher average of prey per stomach and show a greater preference for sharks and bony fishes.

82-000928 Morton, W. M. COMPARATIVE CATCHES AND FOOD HABITS OF DOLLY VARDEN AND ARCTIC CHARRS, *SALVELINUS MALMA* AND *S. ALPINUS*, AT KARLUK, ALASKA, IN 1939-1941. *Environ. Biol. Fishes* 7(1):7-28. 15 Jan. 1982. SFA 27(2)
[E.K. Balon: Dep. Zool., Coll. Biol. Sci., Univ. Guelph, Guelph, ON N1G 2W1, Canada]

82-000929 Persson, L.-E. WERE MACROBENTHIC CHANGES INDUCED BY THINNING OUT OF FLATFISH STOCKS IN THE BALTIC PROPER? *Ophelia* 20(2):137-152. Dec. 1981. SFA 27(2)
[Dep. Anim. Ecol., Ecol. Bldg., S-223 62 Lund, Sweden] Possible causes of longterm increase in macrobenthic biomass in the Baltic proper are discussed. Eutrophication by means of nutrient enrichment is shown to be a process of the last three decades. It is assumed that primary production has doubled during this time. Macrobenthic data from the southern Baltic indicate highly increased biomass values above the halocline between the 1920s and 1950s. During the last three decades no biomass increase was found. Because of these facts, eutrophication is rejected as a major cause of increased macrobenthic biomass. Flatfish populations in the southern Baltic were very dense before the 1920s. This resulted in stunted growth due to strong competition for food. After heavy exploitation in the 1920s and the early 1930s, these stocks were thinned out and showed significantly higher growth rates due to the reduced competition. In the late 1930s the catches of cod increased markedly. Based on evidence from studies of predator-prey relationships it is proposed that the increased macrobenthic biomass values are due to the decreased grazing pressure following the exploitation of the flatfishes. Furthermore, it is assumed that the increase of the stock of cod in the 1930s was due to reduced food competition between young cod and flatfishs, especially the dab.

## FOODS/FEEDING (CONTINUED)

82-000930 Pidgeon, R. W. J. DIET AND GROWTH OF RAINBOW TROUT *SALMO GAIRDNERI* RICHARDSON, IN TWO STREAMS ON THE NEW ENGLAND TABLELAND, NEW SOUTH WALES. *Aust. J. Mar. Freshwater Res.* 32(6):967-974. 1981. SFA 27(2)
[Dep. Zool., Univ. New England, Armidale, N.S.W. 2351, Australia] The diets and growth rates of rainbow trout in the Wollomombi and Guy Fawkes Rivers in northern New South Wales were examined. The growth rate of trout in the Wollomombi River was much higher than that of fish in the Guy Fawkes River. Spearman rank correlation coefficients indicated that stream type was more important than fish size in determining the composition of the diet of the trout. Benthic invertebrates formed the largest component of the diet in both streams: 66.0 and 63.0% of ash-free dry weight (AFDW) in the Wollomombi River and the Guy Fawkes River, respectively. Trout in the Wollomombi River consumed more nektonic prey (33.3% of AFDW) than fish in the Guy Fawkes River (3.6% of AFDW). In contrast, surface food (aquatic imagines and terrestrial insects) made up a much higher proportion of the diet of trout in the Guy Fawkes River (33.9% of AFDW) than in the Wollomombi River (0.6% of AFDW). Crayfish were a major component of the diet (in terms of AFDW) in both streams, their proportions increasing with fish size. The significance of crayfish in relation to fish growth is discussed.

82-000931 Polgar, T. T. and P. Souza. ANALYSIS OF STRIPED BASS LARVAL FEEDING HABITS IN THE POTOMAC ESTUARY: 1976-1977. *Proc. Annu. Meet. Potomac Chap. Am. Fish. Soc.* 5:115-138. 1981(1982). SFA 27(2)
[Environ. Cent. Martin Marietta Corp., 1450 South Rolling Rd., Baltimore, MD 21227] The connections between striped bass larval feeding habits and zooplankton prey composition and abundance in 1976 and 1977 were investigated using data collected by the University of Maryland. Inferences are drawn from the rsults on those aspects of feeding habits that might affect spatial-temporal larval distributions and survivals: food availability and preferences. The analyses indicate that the distributions of feeding and non-feeding larvae are spatially and temporally dependent only in the finfold stage, and that spatial and temporal interactions in feeding condition reflect the evolution of larval abundance distributions due to transport differential mortality. The feeding conditions of yolksac larvae depend on their size (larger larvae feed), and therefore, on development multivariate, non-parametric tests of stomach contents versus zooplankton density and composition). Tests on particularly important prey taxa, adjusted for environmental zooplankton abundance, indicate a few feeding preferences by various larval stages. However, it is possible that higher resulution data on larval stomach contents and zooplankton, providing greater power in statistical tests, might reveal further feeding preferences.

82-000932 Robotham, P. W. J. AN ANALYSIS OF A SPECIALIZED FEEDING MECHANISM OF THE SPINED LOACH, *COBITIS TAENIA* (L.), AND A DESCRIPTION OF THE RELATED STRUCTURES. *J. Fish Biol.* 20(2):173-181. Feb. 1982. SFA 27(2)
[Div. Biol., Derby Lonsdale Coll. High. Educ., Kedleston Rd., Berby, United Kingdom] Aquarium observations and gut analyses of the spined loach, *Cobitis taenia*, suggested that use of a technique by which small items of food could be removed from an almost constant stream of substrate, taken in through the mouth and passed out through the gills. The small amount of indigestible substrate present in the gut contents indicated a very high efficiency level for the process. Photographic investigation revealed a two phased feeding cycle based on the respiratory pumps, consisting of an induction/separation phase and an expulsion/swallowing phase. A morphological study showed large concentrations of mucus secreting goblet cells on the roof of the anterior buccopharyngeal cavity. Other morphological adaptations were noted which resulted in a narrowing of the anterior buccal cavity and a widening of the posterior part along with an increase in the distance between the gill rakers. In the light of this information a method of separation based on differential densities of particles being trapped in a constant stream of mucus is postulated.

FOODS/FEEDING (CONTINUED)

82-000933 Setzler-Hamilton, E. M.; P. W. Jones; F. D. Martin; K. Ripple; J. A. Mihursky; G. E. Drewry and M. Beaven. COMPARATIVE FEEDING HABITS OF WHITE PERCH AND STRIPED BASS LARVAE IN THE POTOMAC ESTUARY. *Proc. Annu. Meet. Potomac Chap. Am. Fish. Soc.* 5:139-157. 1981(1982). SFA 27(2)

[Univ. Md. Cent. Environ. Estuarine Stud., Chesapeake Biol. Lab., Solomons] Gut contents of 2,578 larval white perch, *Morone americana*, and 1,418 larval striped bass, *M. saxatilis*, were analyzed from samples collected in the Potomac River Estuary during 1976 and 1977. Larval white perch began feeding at 3mm TL and striped bass at 5mm TL. At any given size both species consumed the same prey species though proportions varied. Small white perch and striped bass consumed large proportions of rotifers, especially in 1976. Larger sizes ate few or none and primarily fed on copepods and cladocerans. Gut content biomass of both species, however, consisted primarily of copepods, with adult copepods being the dominant constituent after the larvae reach a size of 7 mm TL. Diet overlap, as measured with the Schoener index, index, was found to be significant between both species at each mm-incremental size class.

82-000934 Stoner, A. W. THE INFLUENCE OF BENTHIC MACROPHYTES ON THE FORAGING BEHAVIOR OF PINFISH, *LAGODON RHOMBOIDES* (LINNAEUS). *J. Exp. Mar. Biol. Ecol.* 58(2-3):271-284. 26 Feb. 1982. SFA 27(2)

[Sea Educ. Assoc., P.O. Box 6, Woods Hole, MA 02543] Laboratory experiments showed that the number of amphipods consumed by juvenile pinfish *Lagodon rhomboides* (Linnaeus) decreased significantly with increasing seagrass biomass, but differences occurred among various macrophyte species. Consistently, *Halodule wrightii* Aschers. provided the least protection for amphipods from predation by pinfish, while equivalent standing crops of *Syringodium filiforme* Kütz provided the most protection. *Thalassia testudinum* Banks et König was intermediate in quality as a refuge. Small pinfish (25 to 67mm standard length) consumed more amphipods per unit time than large pinfish (48 to 67 mm standard length). The choice of amphipod prey by pinfish was a function of seagrass biomass, fish size, and prey density, but was independent of macrophyte species. The effect of macrophyte biomass on choice of prey was more pronounced in small pinfish than in large animals. Known distributional patterns of amphipods and pinfish are explained in light of the predation experiments, and the adaptive significance of habitat choice in epifaunal amphipods is discussed. Hypotheses based upon the results of the experiments are offered to explain geographic variation in the food habits of *Lagodon rhomboides*. Foraging behavior was shown to be a complex function of predator, prey, and habitat characteristics.

82-000935 Summers, G. L. FOOD OF ADULT LARGEMOUTH BASS IN A SMALL IMPOUNDMENT WITH DENSE AQUATIC VEGETATION. *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:131-136. 1980[1981]. SFA 27(2)

[Okla. Fish. Res. Lab., Norman 73069] Stomachs of 240 adult largemouth bass (*Micropterus salmoides*) taken from a small impoundment with abundant aquatic vegetation, were evacuated and their contents examined. Thirty percent of the bass had empty stomachs. Crayfish, bluegill (*Lepomis macrochirus*), and young-of-year largemouth bass were the predominant food items. Electivity values (E) indicated negative selection for bluegill and positive selection for young bass. Dense, aquatic macrophytes are probably the major factor influencing the feeding behavior of these bass.

82-000936 Timmons, T. J. and O. Pawaputanon. RELATIVE SIZE RELATIONSHIP IN PREY SELECTION BY LARGEMOUTH BASS IN WEST POINT LAKE, ALABAMA-GEORGIA. *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:248-252. 1980[1981]. SFA 27(2)

[Dep. Fish Allied Aquacult., Auburn Univ., Auburn, AL 36849] Largemouth bass (*Micropterus salmoides*) are able to feed on relatively large prey.

## FOODS/FEEDING (CONTINUED)

82-000936 CONTINUED The relative size of prey, calculated as the ratio of prey length (or weight) to predator length (or weight), changed only slightly with increasing size of largemouth bass. Bluegills (*Lepomis macrochirus*), gizzard shad (*Dorsoma cepedianum*), and threadfin shad (*D. petenense*) were the most common fishes consumed by largemouth bass in West Point Lake. Bluegills were more often eaten by small largemouth bass (3 to 15 cm TL), while shad were eaten by larger ones (>15 cm TL). Regression equations for the sizes of bluegills and shad that largemouth bass consumed were calculated to predict the average size of prey for different sizes of largemouth bass. Largemouth bass could swallow bluegills at 0.4 times their length or shad at 0.5 times their length. The equations of Lawrence (1958) were corroborated by our study of size-selective predation in largemouth bass from West Point Lake.

82-000937 Vinyard, G. L.; R. W. Drenner and D. A. Hanzel. FEEDING SUCCESS OF HATCHERY-REARED KOKANEE SALMON WHEN PRESENTED WITH ZOOPLANKTON PREY. *Prog. Fish-Cult.* 44(1):37-39. Jan. 1982. SFA 27(2)
[Dept. Biol., Univ. Nev., Reno 89557]

82-000938 Warlow, A. D. and R. S. Oldham. TEMPORAL VARIATIONS IN THE DIET OF BROWN TROUT (*SALMO TRUTTA* L.) AND RAINBOW TROUT (*S. GAIRDNERI* R.) IN RUTLAND WATER. *Hydrobiologia* 88(1-2):199-206. 26 Mar. 1982. SFA 27(2)
[Sch. Life Sci., Leicester Polytech., Leicester, England]

82-000939 Webb, P. W. RESPONSES OF NORTHERN ANCHOVY, *ENGRAULIS MORDAX*, LARVAE TO PREDATION BY A BITING PLANKTIVORE, *AMPHIPRION PERCULA*. *NOAA Fish. Bull.* 79(4):727-735. Oct. 1981. SFA 27(2)
[Sch. Nat. Resour., Univ. Mich., Ann Arbor 48109]

82-000940 Witte-Maas, E. L. M. EGGSNATCHING: AN OBSERVATION ON THE FEEDING BEHAVIOUR OF *HAPLOCHROMIS BARBARAE* GREENWOOD, 1967( PISCES, CICHLIDAE). *Neth. J. Zool.* 31(4):786-789. Dec. 1981. SFA 27(2)
[c/o Drs. C.D.N. Barel, Dep. Morphol., Zool. Lab., PB9516, 2300 RA Leiden, The Netherlands]

82-000941 Worgan, J. P. and G. J. FitzGerald. DIEL ACTIVITY AND DIET OF THREE SYMPATRIC STICKLEBACKS IN TIDAL SALT MARSH POOLS. *Can. J. Zool.* 59(12):2375-2379. Dec. 1981. In English with French summ. SFA 27(2)
[Dep. Biol., Fac. Sci. Gen., Univ. Laval, PQ G1K 7P4, Canada] The activity patterns and diet of the adults of three sympatric sticklebacks, *Gasterosteus aculeatus*, *Gasterosteus wheatlandi*, and *Pungitius pungitius*, are compared to learn how three sympatric species share time and food resources. Catch data from unbaited traps indicate that all species are equally diurnal. Females of all species feed almost exclusively in the early morning. No periodicity was observed in the feeding of males compared with females, because males fed infrequently. The diets of the three species were similar though the importance of certain prey items varied with species and sex. Results show that resource partitioning along the dimensions of food type and time are of minor importance in explaining coexistence of the three species during their breeding season.

82-000942 Wright, D. I. THE PLANKTIVOROUS FEEDING BEHAVIOR OF WHITE CRAPPIE (*POMOXIS ANNULARIS*): FIELD TESTING A MECHANISTIC MODEL. *Ph.D. dissertation, Univ. Kans.* 150p. 1981. From Diss. Abstr. Int. B Sci. Eng. 42(8):3122. Feb. 1982. SFA 27(2)

## FOODS/FEEDING (CONTINUED)

82-000943 Yoshiyama, R. M. and J. D. S. Darling. GRAZING BY THE INTERTIDAL FISH *ANOPLARCHUS PURPURESCENS* UPON A DISTASTEFUL POLYCHAETE WORM. *Environ. Biol. Fishes* 7(1):39-45. 15 Jan. 1982. SFA 27(2)
[Environ. Sci. Div., Oak Ridge Natl. Lab., P.O. Box X, Oak Ridge, TN 37830]

## AGE AND GROWTH

82-000944 Ball, R. L. CHANGES IN YELLOW BASS GROWTH RATES AND DENSITY DURING THE FIRST TEN YEARS OF ITS ESTABLISHMENT IN MONROE RESERVOIR. *Proc. Indiana Acad. Sci.* 90:190. 1980(1981). Abstract only. SFA 27(2)
[Indiana Dep. Nat. Resour., Avoca 47420] Growth rates of yellow bass, *Morone mississippiensis*, in Monroe Reservoir have declined rapidly since the first native year class developed in 1969. At the third annulus, back-calculated growth of the 1969 year class averaged 26.2 cm, compared to 19.6 cm for the 1976 year class. Most of the loss of growth has occurred by the end of the second year of life. Growth during the first year of life prior to 1974 averaged 12.0 cm, while it dropped to an average of 9.7 cm in the following five years. Average growth increments during the second year of life decreased 2.1 cm during the same period. Growth in terms of annual length increments indicates that growth has not decreased steadily and is not inversely related to density of yellow bass, although density in terms of kg/ha. of yellow bass has increased over the 10 year study period. Although the size of yellow bass in the Monroe sportfishing catch was good initially (fish averaged 0.13 kg each in 1973 and 1974), the mean weight dropped to 0.10 kg in 1979. Reduced weight and presence of a bacterial infection in the adult population of this species was followed by a reduction in sportfishing harvest of yellow bass in 1979. Limited food supply seems to be the immediate cause of poor growth. Reduction of growth of larger bluegill, and both reduced growth and reduced abundance of yellow perch in Monroe, indicate a dearth of small crustaceans and larval insects for which these three species appear to be competing in the open areas of the lake. Also, a lack of open water predators, such as white bass and walleye, may have contributed to the decline in yellow bass growth rates.

82-000945 Beamish, R. J. and D. E. Chilton. PRELIMINARY EVALUATION OF A METHOD TO DETERMINE THE AGE OF SABLEFISH (*ANOPLOPOMA FIMBRIA*). *Can. J. Fish. Aquatic Sci.* 39(2):277-287. Feb. 1982. In English with French summ. SFA 27(2)
[Dep. Fish. Oceans, Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada]

82-000946 Boehlert, G. W. THE EFFECT OF PHOTOPERIOD AND TEMPERATURE ON LABORATORY GROWTH OF JUVENILE *SEBASTES DIPLOPROA* AND A COMPARISON WITH GROWTH IN THE FIELD. *NOAA Fish. Bull.* 79(4):789-794. Oct. 1981. SFA 27(2)
[Sch. Oceanogr., Oreg. State Univ., Mar. Sci. Cent., Newport 97365]

82-000947 Cailliet, G. M.; D. Kusher; L. Martin and P. Wolf. A REVIEW OF SEVERAL METHODS FOR AGING ELASMOBRANCHS. *Cal-Neva Wildl. Trans.* p. 52-61. 1981. SFA 27(2)
[Moss Landing Mar. Lab., Moss Landing, CA 95039]

82-000948 Gray, P. L.; J. F. Koerner and R. A. Marriott. THE AGE STRUCTURE AND LENGTH-WEIGHT RELATIONSHIP OF SOUTHEASTERN ALASKA COHO SALMON (*ONCORHYNCHUS KISUTCH*), 1969-1970. *Alaska Dep. Fish Game Inf. Leafl.*

## AGE AND GROWTH (CONTINUED)

82-000948 CONTINUED No. 195. iv + 57p. Dec. 1981. SFA 27(2)
[Alaska Dep. Fish Game, Div. Commer. Fish., Southeast. Alaska Coho Res., Juneau]

82-000949 Harrell, R. M. and H. A. Loyacano, Jr. AGE, GROWTH AND SEX RATIO OF THE AMERICAN EEL IN THE COOPER RIVER, SOUTH CAROLINA. *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:349-359. 1980[1981]. SFA 27(2)
[Dennis Wildl. Cent., S.C. Wildl. Mar. Resour. Dep., Bonneau 29431] Age-growth analysis was performed on *Anguilla rostrata* from 2 study sites on the Cooper River, South Carolina. Length ranged from 98 to 834mm and weight ranged from 1 to 1224g. Examination of otoliths gave mean age of 5.1 years with a range of 0-15 years. Length-weight relationship was established as: $\log w = -6.56 + 3.34 \log (L)$. Eels were sexed by morphological and histological examination of gonad tissue. Males comprised only 1.6 percent of the population from Pinopolis Dam and 1.3 percent from Wadboo Creek. Eels smaller than 210mm could not be sexed.

82-000950 Harvey, G. and R. Fortin. CROISSANCE EN LONGUEUR ET EN POIDS DES BARBOTTES BRUNES *ICTALURUS NEBULOSUS* (LE SUEUR) CAPTURÉES À LA FRAYÈRE DE LA RIVIÈRE AUX PINS, PRÈS DE MONTRÉAL (QUÉBEC). [GROWTH IN LENGTH AND WEIGHT OF THE BROWN BULLHEAD *ICTULURUS NEBULOSUS* (LE SUEUR) CAPTURED IN THE SPAWNING GROUNDS IN RIVIÈRE AUX PINS, NEAR MONTREAL (QUEBEC).] *Can. J. Zool.* 60(1):24-30. Jan. 1982. In French with English summ. SFA 27(2)
[Serv. Amenage. Exploitation Faune, Minist. Loisir, Chasse Pêche, Jonquière, PQ G7X 8L6, Canada]

82-000951 Hashim, M. T. and A. A. Shakour. AGE DETERMINATION AND GROWTH STUDIES OF *LETHRINUS MAHSENA* AND *L. XANTHOCHILUS*. *Jeddah J. Mar. Res.* 1:11-20. 1981. SFA 27(2)
[Fac. Mar. Sci., King Abdulaziz Univ., Saudi Arabia]

82-000952 Hogler, S. R. and S. E. Belanger. ON THE USE OF VARIOUS FISH AGEING METHODOLOGIES. *Ohio J. Sci.* 82(2):4. 1982. Abstract only. SFA 27(2)
[Dep. Biol. Sci., Bowling Green State Univ., Bowling Green, OH 43403] Recent investigations concerning estimating ages of fish have indicated that the precision and accuarcy of an estimate is a function of the method employed, water chemistry and the intensity of fishing pressure applied to a stock. Age estimations of white suckers *(Catostomus commersoni)* and freshwater drum *(Aplodinotus grunniens)* from the Maumee River, Ohio, were compared using pectoral fin-rays, dorsal fin-rays and scales. Estimates were not consistent between methods. Age estimations of walleyes *(Stizostedion vitreum)*, taken from Burt Lake, Michigan, were compared using pectoral and pelvic fin-rays, dorsal fin-spines, otoliths and scales. Estimates were not significantly different ($p>.05$) except for the pelvic fin-ray and otolith combination ($p<.05$). Chemistry of the water body and fishing pressure should be evaluated prior to the employment of an ageing method. A subjective merit analysis of each method can be performed based upon the ease of application, distinctiveness and interpretability of annuli, and confidence in the age estimation. For Burt Lake walleye otoliths and pectoral fin-rays were given the highest rating and pelvic fin-rays were given the lowest rating. A second technique should be used as an occasional check for the reliability of the chosen method.

82-000953 Jensen, A. J. and B. O. Johnsen. DIFFICULTIES IN AGING ATLANTIC SALMON (*SALMO SALAR*) AND BROWN TROUT (*SALMO TRUTTA*) FROM COLD RIVERS DUE TO LACK OF SCALES AS YEARLINGS. *Can. J. Fish. Aquatic Sci.*

## AGE AND GROWTH (CONTINUED)

82-000953 CONTINUED 39(2):321-325. Feb. 1982. In English with French summ. SFA 27(2)
[Div. Wildl. Freshwater Fish, Elgesetergt. 10, N-7000 Trondheim, Norway]

82-000954 Kreuz, K. F.; A. V. Tyler; G. H. Kruse and R. L. Demory. VARIATION IN GROWTH OF DOVER SOLES AND ENGLISH SOLES AS RELATED TO UPWELLING. *Trans. Am. Fish. Soc.* 111(2):180-192. Mar. 1982. SFA 27(2)
[Dep. Fish. Wildl., Oreg. State Univ., Corvallis 97331]

82-000955 Sinclair, M.; A. Sinclair and T. D. Iles. GROWTH AND MATURATION OF SOUTHWEST NOVA SCOTIA ATLANTIC HERRING *(CLUPEA HARENGUS HARENGUS)*. *Can. J. Fish. Aquatic Sci.* 39(2):288-295. Feb. 1982. In English with French summ. SFA 27(2)
[Dep. Fish. Oceans, Bedford Inst. Oceanogr., Dartmouth, NS B2Y 4A2, Canada]

82-000956 Smith, R. P. and J. L. Wilson. GROWTH COMPARISON OF TWO SUBSPECIES OF LARGEMOUTH BASS IN TENNESSEE PONDS. *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:25-30. 1980[1981]. SFA 27(2)
[Dep. For. Wildl. Fish., Univ. Tenn., Knoxville 37901] A study was conducted to determine if any growth rate differences occurred between two subspecies of largemouth bass during the first 6 months of growth. Two ponds near Lenoir City, Tennessee, were partitioned into equal halves by a nylon fish barrier. Northern strain fingerlings (*Micropterus salmoides salmoides*) were stocked in one side of each pond and Florida bass (*M. s. floridanus*) in the other sides. *Micropterus salmoides salmoides* showed a significantly faster rate of growth (1.0% level) than *M. s. floridanus*. Mean coefficients of condition (K) and specific growth rates (G) were consistently higher for *M. s. salmoides* during the study period. Since the subspecies were grown in the same water under apparently similar environmental conditions but separated by a barrier, growth differences observed from the fingerling state (1 month old) to 5 months of age were thought to be genetic in nature.

82-000957 Thorson, T. B. and E. J. Lacy, Jr. AGE, GROWTH RATE AND LONGEVITY OF *CARCHARHINUS LEUCAS* ESTIMATED FROM TAGGING AND VERTEBRAL RINGS. *Copeia* 1982(1):110-116. 23 Feb. 1982. SFA 27(2)
[Sch. Life Sci., Univ. Nebr., Lincoln 68588] Data from eight long-term tagging-recapture records and counts of vertebral calcification rings of 15 individuals were combined to develop a model for age determination, growth rate and longevity for the population of *Carcharinus leucas* the occurs in the Lake Nicaragua-Rio San Juan System of Nicaragua and Costa Rica. The growth rate is relatively rapid in the first two years (18 and 16 cm per year), slows gradually to 12 and 11 cm per year and appears to remain at 9 or 10 cm per year for the later years of life. Females have been taken as much as 251 cm long, while males have reached only 214 cm. The proposed growth curve is based on males, except for some of the smallest individuals, so growth rate can only be surmised for large females, by extrapolation. The available evidence suggests that they reach their larger size mainly through longer life-aproximately 16 years for females of about 2.5 meters to about 12 years for males of maximum size.

82-000958 Turner, P. R. PROCEDURES FOR AGE DETERMINATION AND GROWTH RATE CALCULATIONS OF FLATHEAD CATFISH. *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:253-262. 1980[1981]. SFA 27(2)
[Dep. Fish. Wildl. Sci., N. Mex. State Univ., Las Cruces 88003] Cross-sections cut from the articulating process (AP) of pectoral spines were used to determine age and back-calculate growth of 370 flathead catfish

## AGE AND GROWTH (CONTINUED)

82-000958 CONTINUED (*Pylodictis olivaris*) from 2 Oklahoma reservoirs. The accuracy of this method was validated by the following: agreement between the number of annuli and known age of 16 fish; 1 new annulus formed in the pectoral spines of fish tagged in 1970 and recaptured in 1971; agreement between calculated length increments and known length increases of tagged fish; and agreement between assigned age and length frequencies of young fish. Pectoral AP sections were superior to dorsal AP sections for age determinations. Sole use of sections from the distal end of the basal recess of pectoral spines would have resulted in underestimation of age by 1 to 5 years in fish of 3 to 13 years of age.

82-000959 Vondracek, B.; L. R. Brown and J. J. Cech, Jr. COMPARISON OF AGE, GROWTH, AND FEEDING OF THE TAHOE SUCKER FROM SIERRA NEVADA STREAMS AND A RESERVOIR. *Calif. Fish Game* 68(1):36-46. Jan. 1982. SFA 27(2)
[Dep. Wildl. Fish. Biol., Univ. Calif., Davis 95616] The Tahoe sucker, *Catostomus tahoensis*, grew faster in a reservoir than in two tributary streams. Growth rates were evaluated both by comparison of back-calculated lengths using pectoral fin rays and by comparison of standard lengths at capture of age V suckers. Digestive tract fullness and energy content of the diets were not significantly different for fish in the streams or the reservoir, which indicated food availability was not a factor influencing the growth differential. Growing season length or increased maintenance metabolic costs for stream residents are likely temperature-related phenomena explaining observed growth rate differences.

82-000960 Warlen, S. M. AGE AND GROWTH OF LARVAE AND SPAWNING TIME OF ATLANTIC CROAKER IN NORTH CAROLINA. *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:204-214. 1980[1981]. SFA 27(2)
[NMFS, Southeast Fish. Cent., Beaufort Lab., Beaufort, NC 28516] The age and growth of larval Atlantic croaker, *Micropogonias undulatus*, was determined from daily growth increments on their otoliths. Smaller and younger larvae were found offshore near probable spawning areas while larger and older larvae were found near shore and in the lower estuary. A Laird-Gompertz growth model, $L_{(t)} = 0.926 \exp \{2.876[1-\exp(-0.0428t)]\}$, described the growth of larvae to 62 days old. The age-specific growth rate, derived from this relationship, declined with fish age. Atlantic croaker spawned over a 5-month period from mid-September to late-February, with the majority probably spawning in October-November. Larvae were the same size, 9 to 11 mm SL, when they immigrated to the estuary in the period from late-October to mid-April, although mean age of fish entering in January and April (61 to 64 days) was almost twice that of fish entering earlier.

## GEOGRAPHICAL DISTRIBUTION, FISH SURVEYS, ETC.

82-000961 Bailey, R. M. and G. R. Smith. ORIGIN AND GEOGRAPHY OF THE FISH FAUNA OF THE LAURENTIAN GREAT LAKES BASIN. *Can. J. Fish. Aquatic Sci.* 38(12):1539-1561. Dec. 1981. In English with French summ. SFA 27(2)
[Mus. Zool., Univ. Mich., Ann Arbor 48109]

82-000962 Chadwick, E. M. P. and W. J. Bruce. RANGE EXTENSION OF STEELHEAD TROUT (*SALMO GAIRDNERI*) IN NEWFOUNDLAND. *Nat. Can. (Que.)* 108(3):301-303. 1981. In English with French summ. SFA 27(2)
[Dep. Fish. Oceans, P.O. Box 5667, St. John's NF A1C 5X1, Canada]

## GEOGRAPHICAL DISTRIBUTION, FISH SURVEYS, ETC. (CONTINUED)

82-000963 Crabtree, R. E. and J. M. Dean. THE STRUCTURE OF TWO SOUTH CAROLINA ESTUARINE TIDE POOL FISH ASSEMBLAGES. *Estuaries* 5(1):2-9. Mar. 1982. SFA 27(2)
[Va. Inst. Mar. Sci., Gloucester Point, VA 23062] The fish assemblages of two South Carolina estuarine tide pools located in the North Edisto River were sampled from June to October 1977, and during June and July 1978, by haul seine, lift net and channel net. The nekton was dominated numerically by *Fundulus heteroclitus*, *Leiostomus xanthurus*, *Menidia menidia* and *Anchoa mitchilli*. Oyster reef areas were dominated numerically by *Gobiosoma bosci* and *F. heteroclitus*. The relative abundance of tide pool fishes differs from deep water areas of the North Edisto River as described from otter trawls, but is similar to that described by others for South Carolina tidal creeks.

82-000964 Daniels, R. A. and J. H. Lipps. DISTRIBUTION AND ECOLOGY OF FISHES OF THE ANTARCTIC PENINSULA. *J. Biogeogr.* 9(1):1-9. Jan. 1982. SFA 27(2)
[N.Y. State Mus., Biol. Surv., Cult. Educ. Cent., Rm. 3132, Albany, NY 12230]

82-000965 Edwards, A. J. and H. R. Lubbock. THE SHARK POPULATION OF SAINT PAUL'S ROCKS. *Copeia* 1982(1):223-225. 23 Feb. 1982. SFA 27(2)
[Dove Mar. Lab., Cullercoats, Tyne and Wear, NE30 4PZ, U.K.]

82-000966 Ernst, M. E. and J. Nielsen. SJÆLDNE OG TRUEDE FERSKVANDSFISK I DANMARK. [RARE AND THREATENED FRESHWATER FISH IN DENMARK.] *Medd. Ferskvandsfiskerilab. Dan. Fish.-Havunders* 1/80. 70p. 1981. In Danish. SFA 27(2)
[Lysbrogade 52, DK-8600 Silkeborg, Denmark]

82-000967 Goodfellow, W. L., Jr. and J. R. Lebo. FISHES OF THE TOWN CREEK DRAINAGE BEDFORD COUNTY, PENNSYLVANIA AND ALLEGANY COUNTY, MARYLAND. *Proc. Pa. Acad. Sci.* 55(2):147-152. 1981. SFA 27(2)
[Appal. Environ. Lab., Frostburg State Coll., Gunter Hall, Frostburg, MD 21532]

82-000968 Guillen, G. J. and A. M. Landry. SPECIES COMPOSITION AND ABUNDANCE OF ICHTHYOPLANKTON AT BEACHFRONT AND SALTMARSH ENVIRONMENTS. *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:388-403. 1980[1981]. SFA 27(2)
[Dep. Wildl. Fish Sci., Tex. A&M Univ., College Station 77843] Ichthyoplankton communities of Galveston, Texas barrier island environments were characterized from 22 January through 27 August 1979. Beachfront and saltmarsh sites were sampled with a Renfro beam trawl to determine seasonal and diel trends in species composition and abundance of subadult fishes. Beach and saltmarsh constituted important temporary habitats for many ichthyoplankton species. Most larvae initially penetrated beach and tidal pass habitats but sought nutrient-rich saltmarsh environs. The beachfront yielded the highest number of taxa while the saltmarsh produced the greatest catch per effort. Peak ichthyoplankton abundances at both sites occurred during winter and early spring. Day and night sampling at the beach yielded similar catch statistics while peak yields at the saltmarsh consistently occurred during the day.

## GEOGRAPHICAL DISTRIBUTION, FISH SURVEYS, ETC. (CONTINUED)

82-000969 Guillory, V. LONGITUDINAL GRADIENTS OF FISHES IN THOMPSON CREEK, LOUISIANA. *Southwest. Nat.* 27(1):107-115. 19 Feb. 1982. SFA 27(2)
[La. Dep. Wildl. Fish. Mar. Res. Lab., P.O. Box 37, Grand Isle 70358]

82-000970 Heinrich, D. BEITRÄGE ZUR GESCHICHTE DER FISCHFAUNA IN SCHLESWIG-HOLSTEIN: ALLERÖDZEITLICHE FISCHRESTE VON KLEIN NORDENDE, KREIS PINNEBERG. [CONTRIBUTIONS TO THE HISTORY OF THE FISH FAUNA OF SCHLESWIG-HOLSTEIN: ALLERÖD FISH REMAINS FROM KLEIN NORDENDE, KREIS PINNEBERG.] *Zool. Anz.* 207(3-4):181-200. 1981. SFA 27(2)
[Inst. Haustierkd., Biol.-Zent. Univ., Olshausenstr. 40-60, D-2300 Kiel, West Germany]

82-000971 Kauffman, J. FISHERY RESOURCES OF THE SHENANDOAH VALLEY, VIRGINIA. *Proc. Annu. Meet. Potomac Chap. Am. Fish. Soc.* 5:74-89. 1981(1982). SFA 27(2)
[Va. Comm. Game Inland Fish., Richmond]

82-000972 Kozel, T. R.; G. K. Weddle; K. L. Welborn; J. T. Dailey; D. C. Dailey and M. W. Denner. A FISH FAUNAL SURVEY OF POSEY COUNTY, INDIANA. *Proc. Indiana Acad. Sci.* 90:446-453. 1980(1981). SFA 27(2)
[Dep. Biol., Indiana State Univ., Evansville 47712]

82-000973 Maitland, P. S. THE FRESHWATER FISH FAUNA OF THE FORTH AREA. *Forth Nat. Hist.* 4:33-48. 1979. SFA 27(2)
[Inst. Terrest. Ecol., Edinburgh, Scotland]

82-000974 Marenchin, G. L. and D. M. Sever. SURVEY OF THE FISHES OF THE ST. JOSEPH RIVER DRAINAGE IN ST. JOSEPH AND ELKHART COUNTIES, INDIANA. *Proc. Indiana Acad. Sci.* 90:454-460. 1980(1981). SFA 27(2)
[Dep. Biol., Saint Mary's Coll., Notre Dame, IN 46556]

82-000975 Matthews, W. J. and R. McDaniel. NEW LOCALITY RECORDS FOR SOME KANSAS FISHES, WITH NOTES ON THE HABITAT OF THE ARKANSAS DARTER (*ETHEOSTOMA CRAGINI*). *Trans. Kans. Acad. Sci.* 84:219-222. 1981. SFA 27(2)
[Dep. Zool., Univ. Okla., Norman 73019]

82-000976 Matthews, W. J. SMALL FISH COMMUNITY STRUCTURE IN OZARK STREAMS: STRUCTURED ASSEMBLY PATTERNS OR RANDOM ABUNDANCE OF SPECIES? *Am. Midl. Nat.* 107(1):42-54. Jan. 1982. SFA 27(2)
[Dep. Zool., Univ. Okla., Kingston 73439] The distribution and relative abundance of minnows and minnow-like fishes of small Ozark watersheds show patterns that could be attributed to interspecific interactions such as competition. Species that are common throughout most of the region are rare or absent in some streams, and certain species pairs appear to be mutually exclusive. Among 13 common species, morphologically distinct taxa tend to be common or abundant in more watersheds than species whose morphology is nearer to average. However, when compared to a neutral model of community structure based on randomn assembly of species, the actual assemblages of Ozark fishes included no more mutually exclusive species pairs than might result from chance. Overall, despite apparent patterns in field data, the mutual abundance of all 13 species over six watersheds was no more structured than could be explained by random action of laws of probability. Competition, or other biotic interactions, may limit the total number of common or abundant small fish species in Ozark streams, but interactions between particular species pairs does not seem to dominate structure of the fish assemblages.

GEOGRAPHICAL DISTRIBUTION, FISH SURVEYS, ETC. (CONTINUED)

82-000977 Midttun, L.; O. Nakken and A. Raknes. VARIASJONER I UTBREDELSEN AV TORSK I BARENTSHAVET I PERIODEN 1977-1981. [VARIATIONS IN THE GEOGRAPHICAL DISTRIBUTION OF COD IN THE BARENTS SEA IN THE PERIOD 1977-1981.] *Fisken Havet* 1981(4):1-16. 1981. In Norwegian with English summ. SFA 27(2)
[Fiskeridir. Havforskningsinst., Bergen, Norway]

82-000978 Nagelkerken, W. P. DISTRIBUTION AND ECOLOGY OF THE GROUPERS AND SNAPPERS OF THE NETHERLANDS ANTILLES. *Found. Sci. Res. Surinam Netherlands Antilles Publ.* No. 107. 71p. Sept. 1981. Available from Zool. Lab., Plompetorengracht 9, Utrecht, Netherlands. SFA 27(2)

82-000979 Phillips, P. C. ANNOTATED CHECKLIST OF FISHES AT JIQUILISCO BAY, EL SALVADOR. *Rev. Biol. Trop.* 29(1):45-58. July 1981. In English with Spanish summ. SFA 27(2)
[Esc. Cienc. Biol., Univ. Nac., Heredia, Costa Rica]

82-000980 Rosa-Molinar, E. and S. B. Ruth. FIRST RECORD OF THE PINK WORMFISH (*MICRODESMUS LONGIPINNIS*) IN ALABAMA WATERS. *J. Ala. Acad. Sci.* 52(4):220. Oct. 1981. SFA 27(2)
[Dep. Biol., Carver Res. Lab., Tuskegee Inst., AL 36088]

82-000981 Schmidt, R. E. NEW DISTRIBUTION RECORDS OF FRESHWATER FISHES IN NORTH CAROLINA. *J. Elisha Mitchell Sci. Soc.* 96(1):36-38. 1980. SFA 27(2)
[RD#4, Box 208, Newton, NJ 07860] *Notropis cornutus chrysocephalus* is reported for the first time from North Carolina. Four species (*Notropis spectrunculus*, *N. rubricroceus*, *Carassius auratus*, and *Etheostoma chlorobranchium*) are reported as new drainage records from the Pigeon River system (Tennessee River drainage), North Carolina.

82-000982 Schwartz, F. J. and M. Provancha. IDENTITY OF THE SCIAENIDS, DUMPY CROAKERS AND BULLNOSE SPOT IN NORTH CAROLINA. *Fla. Sci.* 45(suppl. 1):27-28. 1982. Abstract only. SFA 27(2)
[Inst. Mar. Sci., Univ. N.C., Morehead City 28557]

82-000983 Shaw, R. F. SEASONAL SPECIES COMPOSITION, DIVERSITY, SPATIAL DISTRIBUTIONS, AND TIDAL RETENTION AND TRANSPORT OF ICHTHYOPLANKTON IN THE SHEEPSCOT RIVER - BACK RIVER - MONTSWEAG BAY ESTUARINE SYSTEM, MAINE. *Ph.D. dissertation, Univ. Me.* 205p. 1981. From Diss. Abstr. Int. B Sci. Eng. 42(8):3074. Feb. 1982. SFA 27(2)

82-000984 Townsend, D. W. COMPARATIVE ECOLOGY AND POPULATION DYNAMICS OF LARVAL FISHES AND ZOOPLANKTON IN TWO HYDROGRAPHICALLY DIFFERENT AREAS ON THE MAINE COAST. *Ph.D. dissertation, Univ. Me.* 282p. 1981. From Diss. Abstr. Int. B Sci. Eng. 42(8):3075. Feb. 1982. SFA 27(2)

82-000985 Williams, C. D. and J. E. Williams. DISTRIBUTION AND STATUS OF NATIVE FISHES OF THE RAILROAD VALLEY SYSTEM, NEVADA. *Cal-Neva Wildl. Trans.* p. 48-51. 1981. SFA 27(2)
[Dep. Biol. Sci., Calif. State Univ., Sacramento 95819]

82-000986 Williams, J. E. and C. D. Williams. DISTRIBUTION AND STATUS OF FISHES OF THE GENUS *GILA* (CYPRINIDAE) IN THE NORTHWESTERN GREAT BASIN. *Cal-Neva Wildl. Trans.* p. 19-24. 1981. SFA 27(2)

## GEOGRAPHICAL DISTRIBUTION, FISH SURVEYS, ETC. (CONTINUED)

82-000986 CONTINUED
[U.S. FWS, 1230 N Street, 14th Floor, Sacramento, CA 95814] The distribution and status of fishes of the genus *Gila* were determined in 36 endorheic basins of the northwestern Great Basin. Seventeen (47%) of the 36 basins contained native populations of *Gila*; represented by *G. bicolor*, *G. alvordensis*, and *G. boraxobius*. All basins inhabited by *Gila*, excepted the Alvord, contain *G. bicolo*. Undescribed endemic subspecies of *G. bicolor* occur in the Silver Lake/Fort rock, Summer, Alkali, Catlow, Guano, Goose Lake, and Dixie Basins. The large number of undescribed subspecies indicated the need for taxonomic surveys. Increased demand for water, associated with agricultural and energy developments, accents the need for ichthyological studies as seceral taxa are threatened with extinction. *Gila boraxobius*, *G. bicolor* subsp. (of Hutton spring in Alkali Basin), *G. bicolor* subsp. (of Summer Basin), and *G. b. vaccaceps* are especially in need of protection.

## ABUNDANCE, FACTORS OF; SURVIVAL AND MORTALITY

82-000987 Collins, J. P. and G. K. Meffe. ELIMINATION OF A GILA TOPMINNOW (*POECILIOPSIS O. OCCIDENTALIS*, POECILIIDAE) POPULATION AND OTHER IMPACTS OF FLOODING IN A SONORAN DESERT STREAM. *Proc. Desert Fishes Counc.* 12:75. 1980(1981). In English and Spanish. Abstract only. SFA 27(2)
[Dep. Zool., Ariz. State Univ., Tempe 85281]

82-000988 Deacon, J. E. EFFECTS OF THE LOW FLOW ON WOUNDFIN IN THE VIRGIN RIVER. *Proc. Desert Fishes Counc.* 12:79-80. 1980(1981). In English and Spanish. Abstract only. SFA 27(2)
[Dep. Biol. Sci., Univ. Nevada, Las Vegas]

82-000989 Edsall, C. C. and M. J. Mac. COMPARATIVE HATCHING SUCCESS OF LAKE TROUT EGGS IN LAKE MICHIGAN WATER AND WELL WATER. *Prog. Fish-Cult.* 44(1):47-48. Jan. 1982. SFA 27(2)
[Great Lakes Fish. Lab., U.S. FWS, Ann Arbor, MI 48105]

82-000990 FitzGerald, G. J. and J.-D. Dutil. EVIDENCE FOR DIFFERENTIAL PREDATION ON AN ESTUARINE STICKLEBACK COMMUNITY. *Can. J. Zool.* 59(12):2394-2395. Dec. 1981. In English with French summ. SFA 27(2)
[Dep. Biol., Univ. Laval, Ste-Foy, PQ G1K 7P4, Canada] The diet of the black-crowned night heron (*Nycticorax nycticorax*) feeding in June and July along the southern shore of the St. Lawrence Estuary was composed primarily of the threespine sticklebaok *Gasterosteus aculeatus*. Three other sticklebacks, *G. wheatlandi*, *Pungitius pungitius*, and *Apeltes quadracus* occur in areas where the birds feed but were not eaten. It is suggested that differential predation on *G. aculeatus* may diminish interspecific competition for nest sites where the four stickleback species co-occur on the breeding grounds.

82-000991 Fortin, R.; P. Dumont; H. Fournier; C. Cadieux and D. Villeneuve. REPRODUCTION ET FORCE DES CLASSES D'ÂGE DU GRAND BROCHET (*ESOX LUCIUS* L.) DANS LE HAUT-RICHELIEU ET LA BAIE MISSISQUOI. [REPRODUCTION AND AGE CLASS STRENGTH OF NORTHERN PIKE (*ESOX LUCIUS* L.) OF THE HAUT-RICHELIEU AND MESSISQUOI BAY.] *Can. J. Zool.* 60(2):227-240. Feb. 1982. In French with English summ. SFA 27(2)
[Dep. Sci. Biol., Univ. Québec, C.P. 8808, Montreal, PQ H3C 3P8, Canada] Captures of northern pike on the spawning grounds and measures of egg deposition showed that from 1975 to 1978 spawning occurred in April, after

## ABUNDANCE, FACTORS OF; SURVIVAL AND MORTALITY (CONTINUED)

82-000991 CONTINUED the onset of spring high waters and the warming of the water above 5-6°C. Maximal egg deposition occurs on abandoned meadows, pastures, and shrub-grass areas, in water 60 cm or less. In the Bleury Stream area, these substrates lie mostly between elevations 30 and 30.5 m. Water temperature influences the length of the spawning and incubation periods. Spawning, egg incubation, and growth of the young to a mean length of 20 mm require approximately 40 days. From 1970 to 1977, two strong year classes (1973 and 1976) were produced; they were both followed by a weak year class. Air temperatures in June, summer water levels (June-September), and also the strength of the preceding year class, had a determining effect on year class strength.

82-000992 Kock, R. L. PATTERNS OF ABUNDANCE VARIATION IN REEF FISHES NEAR AN ARTIFICIAL REEF AT GUAM. *Environ. Biol. Fishes* 7(2):121-136. 15 Mar. 1982. SFA 27(2)
[Div. Aquatic Wildl. Resour., P.O. Box 23367 GMF, Guam, Mariana Islands 96921]

82-000993 Low, R. A., Jr. and S. B. Mathews. FACTORS INFLUENCING OCEAN CATCHES OF SALMON *ONCORHYNCHUS* SPP., OFF WASHINGTON AND VANCOUVER ISLAND. *NOAA Tech Rep. NMFS SSRF* 753. iv + 12p. Jan. 1982. SFA 27(2)
[Mar. Resour. Res. Inst., S.C. Dep. Wildl. Mar. Resour., Charleston 29412] The relative influence of various factors on ocean fishing success was evaluated for pink, *Oncorhynchus gorbuscha*, Chinook, *O. tshawytscha*, and coho, *O. kisutch*, salmon off Washington and Vancouver Island. In addition, an evaluation was made of the practicality of predictive models for ocean catch. For each species, predictive regression equations were developed and their reliability evaluated in terms of the average percentage error of predicted catches from actual catches. Pink salmon catches were significantly correlated with indices of brood year abundance and the average individual weight of fish caught in terminal areas during the brood year. Average error of predicted catches ranged upward of ±25%. Success for chinook salmon in year *i* was highly associated with Columbia River hatchery releases of fall brood year groups *i*-3 and *i*-4, Canadian purse seine catches of immature chinook salmon in Canadian area 20 during August of year *i*-1, and troll catch per effort during the fall of year *i*-1. Washington troll and sport catches of chinook salmon were also significantly correlated with the amount of nominal fishing effort. Coho salmon catches were significantly associated with level of fishing effort, indices of brood year abundance of Columbia River wild coho salmon, and Columbia River jack returns the preceding year. The average error of predicted annual troll coho salmon catches off the central Washington coast was ±15% for 1966-75.

82-000994 Schom, C. B. and E. Halfon. KIN SELECTION AS A SALMONID SURVIVAL STRATEGY EXPLAINING MORTALITY AND VARIABLE GROWTH IN FAMILIES: A MODELING STUDY. *J. Theor. Biol.* 94(1):153-172. 7 Jan. 1982. SFA 27(2)
[Salmon Genet. Res. Prog., N. Am. Salmon Res. Cent., St. Andrews, NB E0G 2X0, Canada] Several studies have shown that Salmonid growth is plastic, which makes it difficult to determine the extent of genetic and environmental influences. A number of hypotheses have been suggested. Kin Selection, as proposed by Hamilton (1946), would require that each family is made up of two groups of individuals. One group would be programmed to die, the other to live. This difference is maintained, in the model, by defining one group as able to avoid predation more easily than the other. Potential survivial to 200 days was evaluated for differences in ability to avoid predation, rates of movement between two redds and the proportion of individuals of each type in a family. If a family was isolated for 200 days a larger number of individuals would survive if a 0.5 to 0.9 difference in fitness existed rather than if all individuals were of one fitness. The optimum proportions would be 550 to 950 more fit individuals out of 1000 total population. Migration reduces but does not eliminate the advantage as only when families

## ABUNDANCE, FACTORS OF; SURVIVAL AND MORTALITY (CONTINUED)

82-000994 CONTINUED mix immediately would a strategy having all individuals of extremely high fitness be advantageous. If this hypothesis is correct and genetically weak individuals are present, they will reduce the efficiency of restocking and aquaculture programs.

82-000995 Stenson, J. A. E. FISH IMPACT ON ROTIFER COMMUNITY STRUCTURE. *Hydrobiologia* 87(1):57-64. 12 Feb. 1982. SFA 27(2)
[Dep. Zool., Univ. Göteborg, Box 25059, S-400 31 Göteborg, Sweden]

82-000996 Vinyard, G. L. VARIABLE KINEMATICS OF SACRAMENTO PERCH (*ARCHOPLITES INTERRUPTUS*) CAPTURING EVASIVE AND NONEVASIVE PREY. *Can. J. Fish. Aquatic Sci.* 39(1):208-211. Jan. 1982. In English with French summ. SFA 27(2)
[Dep. Biol., Univ. Nev., Reno 89557]

## IDENTIFICATION, KEYS, CLASSIFICATION

82-000997 Anderson, M. THE IDENTIFICATION OF THE BRITISH GREY MULLETS. *J. Fish Biol.* 20(1):33-38. Jan. 1982. SFA 27(2)
[Gatty Mar. Lab., Univ. St. Andrews, St. Andrews, Scotland]

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82-001028 Trewavas, E. GENERIC GROUPINGS OF TILAPIINI USED IN AQUACULTURE. *Aquaculture* 27(1):79-81. Feb. 1982. SFA 27(2)
[Br. Mus. (Nat. Hist.), Cromwell Rd., London SW7 5BD, England] The tilapias were formerly included in the genus *Tilapia*. Now only the substratebrooders retain the generic name *Tilapia*, e.g. *Tilapia sparrmanii*, *T. guineensis*. There are two main kinds of mouth-brooders, *Sarotherodon* (e.g *S. galilaeus*) and *Oreochromis* e.g. *O. mossambicus*, *O. niloticus*, *O. macrochir*). In *Sarotherodon* brooding is paternal or biparental (where known), in *Oreochromis* maternal. All are included, with a few other genera, in the Tribe Tilapiini and may be referred to colloquially as tilapias, with a small 't' and no italics.

82-001029 Valdez, R. A. STATUS OF THE DISTRIBUTION AND TAXONOMY OF *GILA CYPHA* IN THE UPPER COLORADO RIVER. *Proc. Desert Fishes Counc.* 12:53-68. 1980(1981). In English and Spanish. SFA 27(2)
[U.S. FWS, 764 Horizon Dr., Grand Junction, CO 81501] New populations of the endangered humpback chub, *Gila cypha*, were encountered in habitat assessment studies by the Colorado River Fisheries Project of the U.S. Fish

## IDENTIFICATION, KEYS, CLASSIFICATION (CONTINUED)

82-001029 CONTINUED and Wildlife Service in 1979-80. These are located in Westwater Canyon and Cataract Canyon, Utah. A third new population is indicated in Debeque Canyon, but since the individuals of this population lack some of the pronounced features of the species, taxonomic verification is still pending. A fourth population, encountered by other investigators in 1977 in Black Rocks, Colorado, was also studied. No estimates of population abundances are presented. Taxonomic studies on individuals of each population continue in order to more clearly distinguish *G. cypha*, *G. robusta*, and *G. elegans*, and to subsequently facilitate their identification afield.

82-001030 Wilde, G. R. TEMPERATURE, SALINITY AND THE TAXONOMY OF THE DEATH VALLEY PUPFISHES *(CYPRINODON)*. *Proc. Desert Fishes Counc.* 12:131. 1980(1981). Abstract only. SFA 27(2)

[Dep. Biol. Sci., Univ. Nev., Las Vegas] Published data for 40 morphometric and meristic characters for 15 populations of Death Valley *Cyprinodon* were subjected to a principal components analysis. The first principal component accounted for 38.4% of the total character variance. Characters with high loadings (correlations) on the first principal component were those known to be affected by temperature and salinity. A three-dimensional plot of the 15 *Cyprinodon* populations on the first three principal components indicated that the first principal component separates populations from warm, saline springs from populations inhabiting cooler, less saline springs. Therefore, I conclude that the first principal component represents character variation due to temperature and/or salinity. Character variation associated with the first principal component was removed from consideration. A phenogram based on the remaining 61.4% of the character variance was constructed. This phenogram shows the phenetic (=phenotypic) similarities between the 15 populations of *Cyprinodon*. The systematic relationships implied by this phenogram are very compatible with the currently recognized relationships among these fishes. This analysis lends credence to the long-time assumption by ichthyologists, that character differences between populations are indicative of genetic differences, even when correlated with temperature and/or salinity.

82-001031 Yabe, M. OSTEOLOGICAL REVIEW OF THE FAMILY ICELIDAE BERG, 1940, (PISCES; SCORPAENIFORMES), WITH COMMENT ON THE VALIDITY OF THIS FAMILY. *Bull. Fac. Fish. Hokkaido Univ.* 32(4):293-315. Nov. 1981. SFA 27(2)

[Lab. Mar. Zool., Fac. Fish., Hokkaido Univ., Hakodate, Japan]

## PARASITES AND DISEASES-GENERAL

82-001032 Elsarnagawy, D. DISEASES OF DENNIS, *CHRYSOPHRYS AURATUS*, IN MARICULTURE AT RATTAMA-EGYPT. *Jeddah J. Mar. Res.* 1:71-77. 1981. SFA 27(2)

[Inst. Oceanogr. Fish., Acad. Sci., Cairo, Egypt]

82-001033 Giavenni, R. CONSIDERAZIONI SULLE PIÙ DIFFUSE FORME MORBOSE RISCONTRABILI A CARICO DEI PESCI ORNAMENTALI. I. PESCI. TROPICALI DI ACQUA DOLCE. [CONSIDERATIONS ON THE MOST FREQUENT ORNAMENTAL FISH DISEASES. I. TROPICAL FRESHWATER AQUARIUM FISHES. *Riv. It. Piscic. Ittiop.* 16(4):130-140. Oct.-Nov.-Dec. 1981. In Italian with English summ. SFA 27(2)

[Med. Vet., S.I.R.A.P., S.p.A., Via Murazzi, 30010 Pellestrina, Venezia, Italy]

## PARASITES AND DISEASES-GENERAL (CONTINUED)

82-001034 Holloway, H. L., Jr. and N. T. Hagstrom. COMPARISON OF FOUR NORTH DAKOTA IMPOUNDMENTS AND FACTORS AFFECTING THE DEVELOPMENT OF IMPOUNDMENT PARASITOFAUNA. *Prairie Nat.* 13(3-4):85-93. Sept.-Dec. 1981. SFA 27(2)

[Biol. Dep., Univ. N. Dak., Grand Forks 58202] Four impoundments in North Dakota are compared with their source rivers in terms of parasite fauna. Lists of species found are presented and factors affecting the development of the parasite fauna after impoundment are proposed. Factors are based on differences in physical make-up of the impoundments and parasite types. The four factors proposed are: degree of environmental change at impoundment, amount of communication of the impoundment and river environments after impoundment, degree of contact with potential sources of new parasites, and the ability of individual parasite species to maintain a continutity of infection after impoundment.

82-001035 Hussein, S. A. and D. H. Mills. THE PREVALENCE OF 'CAULIFLOWER DISEASE' OF THE EEL, *ANGUILLA ANGUILLA* L., IN TRIBUTARIES OF THE RIVER TWEED, SCOTLAND. *J. Fish Dis.* 5(2):161-165. Mar. 1982. SFA 27(2)

[D. H. Mills: Dep. For. Nat. Resour., Univ. Edinburgh, Edinburgh EH9 3JU, Scotland]

82-001036 Miller, N. W. and M. R. Tripp. AN IMMUNOINHIBITORY SUBSTANCE IN THE SERUM OF LABORATORY HELD KILLIFISH, *FUNDULUS HETEROCLITUS* L. *J. Fish Biol.* 20(3):309-316. Mar. 1982. SFA 27(2)

[Dep. Microbiol., Univ. Miss. Med. Cent., Jackson 39216] Serum of the killifish, *Fundulus heteroclitus*, maintained under laboratory conditions for more than four weeks, contained a factor that depressed the immunocytoadherence response to SRBC. When serum was injected into immunocompetent fish 48h prior to antigen stimulation it was effective; when infected simultaneously with the antigen there was no effect. Fractionation of the serum by ultracentrifugation suggests that the inhibitor is either low or very low density lipoprotein. Hypoplysectomy decreased immune inhibition suggesting that the production of the inhibitor may be under the control of the pituitary.

82-001037 Miller, N. W. and M. R. Tripp. THE EFFECT OF CAPTIVITY ON THE IMMUNE RESPONSE OF THE KILLIFISH, *FUNDULUS HETEROCLITUS* L. *J. Fish Biol.* 20(3):301-308. Mar. 1982. SFA 27(2)

[Dep. Microbiol., Univ. Miss. Med. Cent., Jackson 39216] *Fundulus heteroclitus* maintained under laboratory for more than four weeks showed a significantly lower immunocytoadherence (rosette) response to thymus-dependent antigens (SRBC and DNP-BSA) than newly captured fish. There was no comparable effect on scale allograft rejection nor in the response to a thymus-independent antigen (DNP-Ficoll) as measured by the rosette response. This suggests that captivity has a differential effect on a sub-population of lymphocytes analogous to the T-helper cells of mammals.

82-001038 Scott, J. S. ALIMENTARY TRACT PARASITES OF HADDOCK (*MELANOGRAMMUS AEGLEFINUS* L.) ON THE SCOTIAN SHELF. *Can. J. Zool.* 59(12):2244-2252. Dec. 1981. In English with French summ. SFA 27(2)

[Mar. Fish. Div., Dep. Fish Oceans, Biol. Stn., St. Andrews, NB E0G 2X0, Canada]

## BACTERIAL DISEASES

82-001039 Bowers, A. and J. B. Alexander. *IN VITRO* AND *IN VIVO* PASSAGE OF BACTERIA ACROSS RESTRICTED AREAS AND ISOLATED TISSUES OF TROUT, *SALMO TRUTTA* L. AND *S. GAIRDNERI* RICHARDSON. *J. Fish Dis.* 5(2):145-151. Mar. 1982. SFA 27(2)
[Dr. J. B. Alexander: Dep. Biol., Gardner St. Annexe, Univ. Salford, Salford M6 6WZ, England]

82-001040 Cipriano, R. C ASSESSMENT OF THE ABILITY OF HOMEOTHERM IMMUNOGLOBULINS TO CONFER PASSIVE IMMUNITY IN POIKILOTHERM VERTEBRATES. *Fish Health News* 10(1):vi-vii. Jan. 1981. SFA 27(2)
[U.S. FWS, Natl. Fish Health Res. Lab., Kearneysville, WV 25430]

82-001041 Cipriano, R. C. FURUNCULOSIS IN BROOK TROUT: INFECTION BY CONTACT EXPOSURE. *Prog. Fish-Cult.* 44(1):12-14. Jan. 1981. SFA 27(2)
[U.S. FWS, Natl. Fish Health Res. Lab.,Rt. 3, Box 40E, Kearneysville, WV 25430]

82-001042 Cipriano, R. C. IMMUNIZATION OF BROOK TROUT (*SALVELINUS FONTINALIS*) AGAINST *AEROMONAS SALMONICIDA*: IMMUNOGENICITY OF VIRULENT AND AVIRULENT ISOLATES AND PROTECTIVE ABILITY OF DIFFERENT ANTIGENS. *Can. J. Fish. Aquatic Sci.* 39(1):218-221. Jan. 1982. In English with French summ. SFA 27(2)
[U.S. FWS, Natl. Fish Health Res. Lab., Rt. 3, Box 40E, Kearneysville, WV 25430]

82-001043 Eklund, M. W.; M. E. Peterson; F. T. Poysky; L. W. Peck and J. F. Conrad. BOTULISM IN JUVENILE COHO SALMON (*ONCORHYNCHUS KISUTCH*) IN THE UNITED STATES. *Aquaculture* 27(1):1-11. Feb. 1982. SFA 27(2)
[NMFS, 2725 Montlake Blvd. East, Seattle, WA 98122] Botulism type E was first recognized as a major cause of fish mortality in the United States in 1979. This disease caused an estimated loss of 1 1/4 million juvenile salmon reared in earth-bottom ponds during the summer and fall of 1979 and 1980. The botulism outbreaks, preliminary laboratory results of experimental botulism, and precautions to be taken by fish farm employees are discussed.

82-001044 Giorgetti, G. and G. Ceschia. VIBRIOSIS IN RAINBOW TROUT, *SALMO GAIRDNERI* RICHARDSON, IN FRESH WATER IN NORTH-EASTERN ITALY. *J. Fish Dis.* 5(2):125-130. Mar. 1982. SFA 27(2)
[Ist. Zooprof. Spec. Venezie, Aggr. Univ. Padova, 33030 Basaldella di Campoformido, Via della Roggia 70, Udine, Italy]

82-001045 Hayashi, F.; I. Kunimine; K. Harada; M. Inoue and S. Mitsuhashi. [TRANSFORMATION METHOD OF FISH PATHOGEN *AEROMONAS HYDROPHILA* AND SULFANILAMIDE EXPRESSION OF HOST STRAINS.] *Bull. Jpn. Soc. Sci. Fish.* 47(12):1541-1544. Dec. 1981. In Japanese with English summ. SFA 27(2)
[Gunma Pref. Fish. Exp. Stn., 13, Shikishima, Maebashi 371, Japan]

82-001046 Kusuda, R.; A. Sugiyama and K. Kawai. [INFLUENCE OF MEDICATION ON STREPTOCOCCICOSIS AND VIBRIOSIS IN CULTURED AYU.] *Bull. Jpn. Soc. Sci. Fish.* 47(10):1309-1315. Oct. 1981. In Japanese with English summ. SFA 27(2)
[Fish Dis. Lab., Fac. Agric., Kochi Univ., Nankoku, Kochi 783, Japan]

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82-001047 Thune, R. L. and J. A. Plumb. EFFECT OF DELIVERY METHOD AND ANTIGEN PREPARATION ON THE PRODUCTION OF ANTIBODIES AGAINST *AEROMONAS HYDROPHILA* IN CHANNEL CATFISH. *Prog. Fish-Cult.* 44(1):53-54. Jan. 1982. SFA 27(2)
[Dep. Vet. Microbiol. Parasitol., La. State Univ., Baton Rouge 70803]

## FUNGAL DISEASES

82-001048 Alderman, D. J. *IN VITRO* TESTING OF FISHERIES CHEMOTHERAPEUTANTS. *J. Fish Dis.* 5(2):113-123. Mar. 1982. SFA 27(2)
[Minist. Agric. Fish. Food, Fish Dis. Lab., Weymouth, Dorset, England]

## PROTOZOAN DISEASES

82-001049 Booker, O. J. and W. L. Current. *MYXOBILATUS MICTOSPORA* (KUDO, 1920) (MYXOZOA: MYXOSPOREA) IN THE LARGEMOUTH BASS (*MICROPTERUS SALMOIDES* LACÉPÈDE): PLASMODIUM MORPHOLOGY AND FINE STRUCTURE. *J. Parasitol.* 67(6):859-865. Dec. 1981. SFA 27(2)
[Dep. Zool.-Entomol., Auburn Univ., Auburn, AL 36849]

82-001050 Crandall, T. A. and P. R. Bowser. A MICROSPORIDIAN INFECTION IN MOSQUITOFISH, *GAMBUSIA AFFINIS*, FROM ORANGE COUNTY, CALIFORNIA. *Calif. Fish Game* 68(1):59-61. Jan. 1982. SFA 27(2)
[Aquacult. Prog., Agric. Exp. Stn., Univ. Calif., Davis 95616]

82-001051 Ingram, K. M. and L. G. Mitchell. PANCREATIC INFECTIONS OF *MYXOBOLUS OSBURNI* HERRICK (MYXOZOA: MYXOSPOREA) IN THE PUMPKINSEED, *LEPOMIS GIBBOSUS* (LINNAEUS) IN IOWA. *J. Wildl. Dis.* 18(1):75-79. Jan. 1982. SFA 27(2)
[Dep. Zool., Iowa State Univ., Ames 50011]

82-001052 Khan, R. A. and M. W. Newman. BLOOD PARASITES FROM FISH OF THE GULF OF MAINE TO CAPE HATTERAS, NORTHWEST ATLANTIC OCEAN, WITH NOTES ON THE DISTRIBUTION OF FISH HEMATOZOA. *Can. J. Zool.* 60(3):396-402. Mar. 1982. In English with French summ. SFA 27(2)
[Mar. Sci. Res. Lab., Memorial Univ. Newfoundland, St. John's, NF A1C 5S7, Canada]

82-001053 McArthur, C. P. and S. Sengupta. ANTIGENIC MIMICRY OF EEL TISSUES BY A MYXOSPORIDIAN PARASITE? *Z. Parasitenkd.* 66(3):249-255. Feb. 1982. SFA 27(2)
[Dep. Microbiol. Publ. Health, Mich. State Univ., East Lansing 48824]

82-001054 Shariff, M. *HENNEGUYA SHAHARINI* SP. NOV. (PROTOZOA: MYXOZOA), A PARASITE OF MARBLE GOBY, *OXYELEOTRIS MARMORATUS* (BLEEKER). *J. Fish Dis.* 5(1):37-45. Jan. 1982. SFA 27(2)
[Fac. Fish Mar. Sci., Univ. Pertanian Malaysia, Serdang, Selangor, Malaysia]

## PROTOZOAN DISEASES (CONTINUED)

82-001055 Solangi, M. A.; R. M. Overstreet and J. W. Fournie. EFFECT OF LOW TEMPERATURE ON DEVELOPMENT OF THE COCCIDIUM *EIMERIA FUNDULI* IN THE GULF KILLIFISH. *Parasitology* 84(1):31-39. Feb. 1982. SFA 27(2)
[Gulf Coast Res. Lab., Ocean Springs, MS 39564]

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## VIRAL DISEASES

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[Osborn Lab. Mar. Sci., N.Y. Aquarium, N.Y. Zool. Soc., Brooklyn 11224]

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82-001066 Cone, D. K. *GYRODACTYLUS PLEURONECTI* N. SP. (MONOGENEA) FROM WINTER FLOUNDER (*PSEUDOPLEURONECTES AMERICANUS*) IN NEWFOUNDLAND, CANADA. *Can. J. Zool.* 59(12):2241-2243. Dec. 1981. In English with French summ. SFA 27(2)
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[J. Llewellyn: Dep. Zool., Birmingham Univ., P.O. Box 363, Birmingham B15 2TT, England]

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[M.E. Rau: Inst. Parasitol., McGill Univ., Macdonald Coll., Ste Anne de Bellevue, PQ H9X 1C0, Canada]

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[Miss. State Univ., Res. Cent., Natl. Space Technol. Lab., NSTL Station 39529]

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82-001073 Hoole, D. and C. Arme. ULTRASTRUCTURAL STUDIES ON THE CELLULAR RESPONSE OF ROACH, *RUTILUS RUTILUS* L., TO THE PLEROCERCOID LARVA OF THE PSEUDOPHYLLIDEAN CESTODE, *LIGULA INTESTINALIS*. *J. Fish Dis.* 5(2):131-144. Mar. 1982. SFA 27(2)
[C. Arme: Dep. Biol. Sci., Univ. Keele, Keele, Staffshire ST5 5BG, England]

82-001074 Jilek, R. and J. L. Crites. INTESTINAL HISTOPATHOLOGY OF THE COMMON BLUEGILL, *LEPOMIS MACROCHIRUS* RAFINESQUE, INFECTED WITH *SPINITECTUS CAROLINI* HOLL, 1928 (SPIRURIDA: NEMATODA). *J. Fish Dis.* 5(1):75-77. Jan. 1982. SFA 27(2)
[Dep. Biomed. Eng., Coll. Med., Box 377 Med. Cent., Univ. Va., Charlottesville 22908]

82-001075 Kulshrestha, A. K. and P. K. Mandal. PATHOLOGY OF GAS BUBBLE DISEASE IN TWO AIR-BREATHING CATFISHES (*CLARIAS BATRACHUS* LINN. AND *HETEROPNEUSTES FOSSILIS* BLOCH.). *Aquaculture* 27(1):13-17. Feb. 1982. SFA 27(2)
[Dep. Zool., Univ. Allahabad, Allahabad 211 002, India] Gross pathology in *Clarias batrachus* and *Heteropneustes fossilis*, and histopathology in the liver, intestine and kidney and abnormalities in erythrocyte count/mm$^3$ and haemoglobin g% of *C. batrachus* afflicted with gas bubble disease were studied over 96h. Histopathology and blood abnormalites in *H. fossilis* could not be observed due to heavy mortality. A tilt in the swimming posture and upward bend in the tail region were the first signs of the disease. Exophthalmia was noted and blebs containing gas bubbles appeared on the fins and other parts of the body. The blebs burst producing open lesions after 72 h, and the fins became necrotic. Histopathologic changes included, in the liver, vacuolation of cells, necrosis and cordal; in the intestine, lesions in the villi, degeneration of the submucosa, cellular exudate production in the lumen and air bubbles in the villi; and in the kidney, degeneration of tubules and glomeruli and necrosis of haemopoietic tissue. Erythrocyte count and haemoglobin content showed a consistent and significant fall from $12.87 \times 10^6$ to $6.91 \times 10^6$ and from 9.33 to 7.00 g%, respectively, up to 72h. Empty blood vessels were noted in the liver, intestine and kidney. Fish of both species regained normal swimming orientation, and erythrocyte count and haemoglobin content also showed recovery from the disease.

82-001076 Lemly, A. D. EFFECTS OF A LARVAL PARASITE ON THE GROWTH AND SURVUVAL OF YOUNG BLUEGILL. *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:263-274. 1980[1981]. SFA 27(2)
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[Dep. Entomol., Macdonald Campus of McGill Univ., Ste-Anne-de-Bellevue, PQ H9X 1C0, Canada]

82-001078 Maxwell, J. G. H. INFESTATION OF THE JACK MACKEREL, *TRACHURUS DECLIVIS* (JENYNS), WITH THE CYMOTHOID ISOPOD, *CERATOTHOA IMBRICATUS* (FABRICUS), IN SOUTH EASTERN AUSTRALIAN WATERS. *J. Fish Biol.* 20(3):341-349. Mar. 1982. SFA 27(2)
[Div. Fish. Res., CSIRO Mar. Lab., P.O. Box 21, Cronulla, NSW 2230, Australia]

82-001079 McArthur, C. P. and S. Sengupta. A RAPID MICRO-METHOD FOR SCREENING EEL SERA FOR ANTIBODIES AGAINST THE DIGENEAN *TELOGASTER OPISTHORCHIS* MACFARLANE, 1945. *J. Fish Dis.* 5(1):67-70. Jan. 1982. SFA 27(2)
[Dep. Microbiol. Publ. Health, Mich. State Univ., East Lansing 48824]

82-001080 McVicar, A. H. and P. G. White. THE PREVENTION AND CURE OF AN INFECTIOUS DISEASE IN CULTIVATED JUVENILE DOVER SOLE, *SOLEA SOLEA* (L.). *Aquaculture* 26(3-4):213-222. Jan. 1982. SFA 27(2)
[Mar. Lab., Victoria Rd., Aberdeen, Scotland] The disease condition "Black Patch Necrosis" which causes serious mortalities of cultivated Dover sole through the development of areas of fin and skin necrosis, was shown to be infectious by co-habitation of diseased and healthy stocks. Spread of the disease throughtout an affected tank was rapid and high pathogenicity was evident, with most affected sole dying 1-2 days after the first appearance of clinical signs. Addition of a sand substrate to tanks both prevented occurrence of the disease and cured an established disease situation. No aetiological agent has yet been identified.

82-001081 Mitchell, A. J.; C. E. Smith and G. L. Hoffman. PATHOGENICITY AND HISTOPATHOLOGY OF AN UNUSUALLY INTENSE INFECTION OF WHITE GRUBS (*POSTHODIPLOSTOMUM M. MINIMUM*) IN THE FATHEAD MINNOW (*PIMEPHALES PROMELAS*). *J. Wildl. Dis.* 18(1):51-57. Jan. 1982. SFA 27(2)
[U.S. FWS, Fish Farm. Exp. Stn., Stuttgart, AR 72160]

82-001082 Molnar, K.; G. L. Chan and C. H. Fernando. SOME REMARKS ON THE OCCURRENCE AND DEVELOPMENT OF PHILOMETRID NEMATODES INFECTING THE WHITE SUCKER, *CATOSTOMUS COMMERSONI* LACÉPÈDE (PISCES: CATOSTOMIDAE), IN ONTARIO. *Can. J. Zool.* 60(3):443-451. Mar. 1982. In English with French summ. SFA 27(2)
[Vet. Med. Inst., P.O. Box 18, Budapest 1581, Hungary]

82-001083 Moody, J. and E. Gaten. THE POPULATION DYNAMICS OF EYEFLUKES *DIPLOSTOMUM SPATHACEUM* AND *TYLODELPHYS CLAVATA* (DIGENEA: DIPLOSTOMATIDAE) IN RAINBOW AND BROWN TROUT IN RUTLAND WATER: 1974-1978. *Hydrobiologia* 88(1-2):207-209. 26 Mar. 1982. SFA 27(2)
[Dep. Zool., Univ. Leicester, Leicester LE1 7RH, England]

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[Mass. Coop. Fish. Res. Unit, Univ. Mass., Amherst 01003]

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82-001086 Smith, C.; J. Morrison and H. Ramsey. PROLIFERATIVE KIDNEY DISEASE (PKD): FIRST OUTBREAK IN NORTH AMERICA. *Fish Health News* 10(1):iii-v. Jan. 1981. SFA 27(2)
[U.S. FWS, Fish Cult. Div. Cent., Bozeman, MT 59715]

82-001087 Thompson, J. S. AN EPIZOOTIC OF LYMPHOMA IN NORTHERN PIKE, *ESOX LUCIUS* L., FROM THE ÅLAND ISLANDS OF FINLAND. *J. Fish Dis.* 5(1):1-11. Jan. 1982. SFA 27(2)
[Dep. Virol., Univ. Helsinki, Haartmaninkatu 3, 00290 Helsinki 29, Finland]

82-001088 Woodhead, A. D. SKIN LESIONS IN THE TAIL OF THE SPINY DOGFISH, *SQUALUS ACANTHIAS* L. *J. Fish Dis.* 5(1):71-74. Jan. 1982. SFA 27(2)
[Biol. Dep., Brookhaven Natl. Lab., Upton, NY 11973]

82-001089 Zietse, M. A.; E. van den Broek and E. E. A. Erwteman-ooms. STUDIES ON THE LIFE-CYCLE OF *ASYMPHYLODORA TINCAE* MODEER, 1790 (TREMATODA: MONORCHIIDAE) IN A SMALL LAKE NEAR AMSTERDAM. PART 2: THE RELATIONS BETWEEN *ASYMPHYLODORA TINCAE* AND ITS DEFINITIVE HOST, *TINCA TINCA*. *J. Helminthol.* 55(4):239-246. Dec. 1981. SFA 27(2)
[Dep. Aquatic Ecol., Univ. Amsterdam, Kruislaan 320, 1098 SM Amsterdam, Netherlands]

## POLLUTION

82-001090 Bregazzi, P. R. and C. R. Kennedy. THE RESPONSES OF A PERCH, *PERCA FLUVIATILIS* L., POPULATION TO EUTROPHICATION AND ASSOCIATED CHANGES IN FISH FAUNA IN A SMALL LAKE. *J. Fish Biol.* 20(1):21-31. Jan. 1982. SFA 27(2)
[Univ. Reading, Dep. Agric. Horticult., Early Gate, Reading RG6 2AT, England] A number of parameters were measured in a population of perch whose numbers had declined steeply in a habitat subjected to increasing eutrophication, and these measurements were compared with those taken before the population decline. Contrary to expectation, no adaptive responses were identified. The growth rate of perch up to the age of III had only declined slightly, and there was a marked preponderance of young fish. Relative growth rate was consistent despite the population decline. No dominant year class was apparent. Mean instantaneous mortality rate and annual survival rate were calculated, and the length-weight relationship was analysed. Feeding strategy had not altered since an earlier study. A decline was seen in the percentage of perch maturing at early age. Ripeness coefficients and fecundity estimates were calculated. A previously documented spawning migration was confirmed. The absence of the expected adaptive changes is discussed.

82-001091 Cherry, D. S.; S. R. Larrick; J. D. Giattina; J. Cairns, Jr. and J. Van Hassel. INFLUENCE OF TEMPERATURE SELECTION UPON THE CHLORINE AVOIDANCE OF COLD-WATER AND WARMWATER FISHES. *Can. J. Fish. Aquatic Sci.* 39(1):162-173. Jan. 1982. In English with French summ. SFA 27(2)
[Univ. Cent. Environ. Stud., VPI&SU, Blacksburg, VA 24061]

POLLUTION (CONTINUED)

82-001092 Chung, K. S. and K. Strawn. PREDICTED SURVIVAL OF THE BAY ANCHOVY (*ANCHOA MITCHILLI*) IN THE HEATED EFFLUENT OF A POWER PLANT ON GALVESTON BAY, TEXAS. *Environ. Biol. Fishes* 7(1):57-62. 15 Jan. 1982. SFA 27(2)

[Inst. Oceanogr., Univ. Oriente, Cumaná, Venezuela] The bay anchovy (*Anchoa mitchilli*), collected from the intake canal of the P.H. Robinson Generating Station, Bacliff, Texas, were tested for 180 min at various constant temperatures during June 1974 through September 1975 to determine if they could survive passage through the discharge canal system. Three-h survival temperatures were significantly lower, throughout the year, than the temperatures in the discharge canal both afferent and efferent to the cooling towers. This indicates that the bay anchovy entrained and entrapped from the intake canal and exposed to the heated effluent could not survive in the cooling water system. However, the cooling towers should aid survival of the fish in the canal below the towers.

82-001093 Cravedi, J. P. and J. Tulliez. ACCUMULATION, DISTRIBUTION AND DEPURATION IN TROUT OF NAPHTHENIC AND ISOPRENOID HYDROCARBONS (DODECYLCYCLOHEXANE AND PRISTANE). *Bull. Environ. Contam. Toxicol.* 28(2):154-161. Feb. 1982. SFA 27(2)

[Lab. Rech. Additifs Alimentaires, I.N.R.A., 180, chemin, de Tournefeuille, 31300 Toulouse, France]

82-001094 Fickeisen, D. H.; C. D. Becker and D. A. Neitzel. REVIEW OF PACIFIC NORTHWEST LABORATORY RESEARCH ON AQUATIC EFFECTS OF HYDROELECTRIC GENERATION AND ASSESSMENT OF RESEARCH NEEDS. *Battelle Pac. Northwest Lab.* PNL-3816. 28p. May 1981. SFA 27(2)

[Battelle Northwest Lab., Richland, WA]

82-001095 Gustavsson, I. and J. Golimowski. ANALYSIS OF MERCURY IN FISH MUSCLE SAMPLES BY ASV-TECHNIQUE. *Sci. Total Environ.* 22(1):85-87. Dec. 1981. SFA 27(2)

[Inst. Chem., Anal. Dep., Univ. Uppsala, S-751 21 Uppsala, Sweden]

82-001096 Hendricks, M. L.; C. H. Hocutt and J. R. Stauffer, Jr. FAUNAL INVENTORY OF THE UPPER POTOMAC RIVER RELATIVE TO ACID MINE DISCHARGES. *Proc. Annu. Meet. Potomac Chap. Am. Fish. Soc.* 5:1-57. 1981(1982). SFA 27(2)

[Radiation Manage. Corp., Muddy Run Ecol. Lab., P.O. Box 10, Drumore, PA 17518]

82-001097 Holden, A. V. and G. Topping. REPORT ON FURTHER INTERCALIBRATION ANALYSES IN ICES POLLUTION MONITORING AND BASELINE STUDIES. *Int. Counc. Explor. Sea Coop. Res. Rep.* No. 108. 75p. Sept. 1981. SFA 27(2)

[Palægade 2-4, DK-1261 Copenhagen K, Denmark]

82-001098 International Council for the Exploration of the Sea. REPORTS ON ICES INTERCALIBRATIONS OF MERCURY AND CADMIUM IN SEA WATER, 1979. *Int. Counc. Explor. Sea Coop. Res. Rep.* No. 110. 55p. Nov. 1981. SFA 27(2)

[Palægade 2-4, 1261 Copenhagen K, Denmark]

82-001099 Kimmel, W. G.; C. A. Miller and T. C. Moon. THE IMPACT OF A DEEP-MINE DRAINAGE ON THE WATER QUALITY AND BIOTA OF A SMALL HARD-WATER STREAM. *Proc. Pa. Acad. Sci.* 55(2):137-141. 1981. SFA 27(2)

[Dep. Biol. Environ. Sci., Calif. State Coll., California, PA 15419] The impact of a point-source deep-mine discharge on the water quality, benthos, and fish of a small hard-water stream in southwestern Pennsylvania (USA) was

## POLLUTION (CONTINUED)

82-001099 CONTINUED studied over a six-month period. The major water quality changes produced by the effluent were marked increases in total iron and sulfate and a moderate depression in pH. The macroinvertebrate communities downstream from the effluent were significantly depressed in numbers, biomass, and diversity. Significant negative linear relationships were found between total iron and the various macroinvertebrate community parameters. The fish communities downstream from the effluent were depauperate although individual population responses varied. Only the stoneroller, (*Campostoma anomalum*), was totally eliminated from the affected areas.

82-001100 Lewis, G. E. FISH DISTRIBUTION AND WATER QUALITY OF THE UPPER NORTH BRANCH OF THE POTOMAC RIVER BASIN OF WEST VIRGINIA. *Proc. Annu. Meet. Potomac Chap. Am. Fish Soc.* 5:58-73. 1981(1982). SFA 27(2)
[W. Va. Dep. Nat. Resour., Drawer C, Romney 26757]

82-001101 Liaw, W. K. and F. M. Atton. ACID RAIN ON NORTHERN LAKES: BACKGROUND STUDIES IN SASKATCHEWAN. *Musk-Ox* 28:26-42. 1981. In English with French summ. SFA 27(2)
[Saskatchewan Fish. Lab., 30 Campus Dr., Saskatoon S7N 0X1, Canada] This report examines water quality data compiled from 1938 to 1979 for over 600 Saskatchewan water bodies, and provides background information needed for the assessment of potential acid rain problems. Saskatchewan is unique in having waters encompassing the full range of total dissolved solids (TDS) found in inland waters. In spite of this vast variation, these lakes and streams can be grouped into four major zones which approximate the vegetation and soil zones of the province. These zones may be broadly denoted as Canadian Shield, Forest, Aspen Parkland, and Prairie. They have TDS up to 100, 200, 500 and over 500 ppm, respectively. The corresponding average alkalinities indicating the capacity to absorb acid are 18, 124, and 186, and 325 ppm. In general, lakes with lower TDS on the Shield have pH values between 6.5 and 7.5. More saline lakes have higher pH values, frequently between 8.0 and 9.0. Values as low as 5.56 and as high as 10.0 have been recorded. Northern Saskatchewan Shield lakes are similar to Ontario Shield lakes with respect to TDS and alkalinity, as well as watershed characteristics. They are sensitive to acidic fallout. Estimates of acidification rates, based on determinations of the lakes' buffering capacity, suggest that small, shallow Shield lakes with low alkalinity are particulary vulnerable to potential acid contamination. Data are needed on the pH and the buffering capacity of those lakes within some 350 km downwind of Fort McMurray and Cold Lakes, particularly those with the potential for fish spawning and nursery grounds. These findings generally establish the uncontaminated condition of Saskatchewan waters in respect of TDS, alkalinity, and pH against which future changes may be evaluated.

82-001102 Matthiessen, P.; P. J. Fox; R. J. Douthwaite and A. B. Wood. ACCUMULATION OF ENDOSULFAN RESIDUES IN FISH AND THEIR PREDATORS AFTER AERIAL SPRAYING FOR THE CONTROL OF TSETSE FLY IN BOTSWANA. *Pestic. Sci.* 13(1):39-48. Feb. 1982. SFA 27(2)
[Cent. Overseas Pest Res., Overseas Dev. Admin., College House, Wrights Lane, London W8 5SJ, England]

82-001103 Mehrle, P. M.; T. A. Haines; S. Hamilton; J. L. Ludke; F. L. Mayer and M. A. Ribick. RELATIONSHIPS BETWEEN BODY CONTAMINANTS AND BONE DEVELOPMENT IN EAST-COAST STRIPED BASS. *Trans. Am. Fish. Soc.* 111(2):231-241. Mar. 1982. SFA 27(2)
[Columbia Natl. Fish. Res. Lab., Rt. 1, Columbia, MO 65201]

82-001104 Nelson, J. A. PHYSIOLOGICAL OBSERVATIONS ON DEVELOPING RAINBOW TROUT, *SALMO GAIRDNERI* (RICHARDSON), EXPOSED TO LOW pH AND VARIED CALCIUM ION CONCENTRATIONS. *J. Fish Biol.* 20(3):359-372. Mar. 1982. SFA 27(2)

POLLUTION (CONTINUED)

82-001104 CONTINUED
[Dep. Zool., Univ. Wash., NJ-15 Seattle 98195] The extinction of piscine populations in waters acidified by atmospheric fallout of pollutants and runoff from coal strip mines usually occurs through recruitment failure. To determine mechanisms of recruitment failure, several physiological parameters of developing rainbow trout were monitored while fish were exposed to conditions of low pH and varied calcium ion concentrations. Cardiac rate, ossification, growth, tissue calcium concentrations, protein maturation, hatching, and mortality were examined. Results indicate a decreased cardiac rate, decreased rate of ossification, slower growth, less pigmentation, delayed hatching and increased mortality under conditions of low pH. Cardiac rate, hatching and mortality varied with the external calcium concentration.

82-001105 Neumann, D. A.; J. M. O'Connor; J. A. Sherk, Jr. and K. V. Wood. RESPIRATORY RESPONSE OF STRIPED BASS (*MORONE SAXATILIS*) TO SUSPENDED SOLIDS. *Estuaries* 5(1):28-39. Mar. 1982. SFA 27(2)
[Sch. Life Health Sci., Univ. Del., Newark 19711] Oxygen consumption rates were measured individually for mixed groups of male, female, and immature striped bass, *Morone saxatilis*, in filtered Patuxent River, Maryland, water and in filtered water containing suspensions of either fuller's earth or Patuxent River sediment. Oxygen consumption was determined at fixed swimming speeds at two temperatures, 15 and 22.5°C. Oxygen consumption of striped bass in filtered 15°C water increased as swimming speed increased. At 22.5°C, the same range of swimming speeds had no effect on rates of oxygen consumption. Similar data were obtained with fish swimming at the same speeds in water containing 0.79 g per liter fuller's earth particles (15°C), and among those swimming at 31.7 and 49.0 cm per s in water containing 1.32 g per l Patuxent River sediment (22.5°C). Male and female striped bass respiration rates were similar under all test conditions. At 15°C, striped bass oxygen consumption rates during exposure to fuller's earth while swimming at 8.6 and 31.7 cm per s did not differ from rates of fish swimming at the same speeds in filtered water. At 49.0 cm per s, rates were significantly depressed. Respiration rates of fish exposed to Patuxent River sediment at 22.5°C while swimming at 31.7 and 49.0 cm per s were significantly lower than those of fish in filtered water. Respiratory response of striped bass to suspended particle stress was manifested by depressed oxygen consumption. This is considered a short-term response to an acute stress. This response and the potential for hematological response to chronic suspended particle stress are discussed.

82-001106 Niemi, M. and I. Taipalinen. FAECAL INDICATOR BACTERIA AT FISH FARMS. *Hydrobiologia* 86(1-2):171-175. 16 Jan. 1982. SFA 27(2)
[Natl. Board Waters, P.O. Box 250, SF-00101 Helsinki 10, Finland]

82-001107 Soholt, L. F.; R. W. Vocke; V. A. Harris; M. J. Knight and B. Siskind. COAL COMBUSTION WASTE MANUAL: EVALUATING IMPACTS TO FISH AND WILDLIFE. *U.S. Fish Wildl. Serv.* FWS/OBS-81/05. xii + 151p. Aug. 1981. SFA 27(2)
[Div. Environ. Impact Stud., Argonne Natl. Lab., 9700 South Cass Ave., Argonne, IL 60439]

82-001108 Spigarelli, S. A.; R. M. Goldstein; W. Prepejchal and M. M. Thommes. FISH ABUNDANCE AND DISTRIBUTION NEAR THREE HEATED EFFLUENTS TO LAKE MICHIGAN. *Can. J. Fish. Aquatic Sci.* 39(2):205-315. Feb. 1982. In English with French summ. SFA 27(2)
[Ecol. Sci. Sect., Radiol. Environ. Res. Div., Argonne Natl. Lab., Argonne, IL 60439]

## POLLUTION (CONTINUED)

82-001109 Srivastava, P. N. and A. S. Narain. LEUCOCYTIC AND HAEMOSTATIC REACTIONS OF THE INDIAN CATFISH, *HETEROPNEUSTES FOSSILIS*, SUBJECTED TO ENVIRONMENTAL POLLUTION BY SEWAGE, FERTILISERS AND INSECTICIDES. *Acta Pharmacol. Toxicol.* 50(1):13-21. Jan. 1982. SFA 27(2)
[Dep. Zool., Univ. Gorakhpur, Gorakhpur 273001, India] Total and differential leucocyte counts, thrombocyte count and blood clotting time of fishes exposed up to 40 days to sewage and some of its individually reproduced chemical factors, fertilisers (urea, potash), chlorinated insecticides (BHC, endrin) and organophosphorus insecticides (monochrotophos, phosphamidon) indicate pathological disturbances involving injury and haemorrhage in tissues.

82-001110 Tervet, D. J. THE IMPACT OF FISH FARMING ON WATER QUALITY. *Water Pollut. Control.* 80(5):571-581. 1981. SFA 27(2)
[Solway River Purification Board, Scotland] The quantification of the problem of pollution caused by fish-farm effluents cannot be achieved through routine monitoring and has required a special study. A considerable reduction in water quality has been shown to occur on many occasions at a fish farm and these occasions were especially serious where the farm abstracted most or all of the water from a watercourse. Although in monitoring an ecosystem, there are innumerable variables that affect its performance, the extent of the reduction in quality has been shown to correlate closely with the weight of fish carried and the flow through the farm. The most significant conclusion that may be drawn from this work is that pollution is liable to be caused downstream from fish farms unless annual production rates of much less than 200 tonnes are accepted for each 1 $m^3$/s of available flow. The constraint is less serious as the residual flow in a watercourse increases but is significantly affected by the quality of water available. If fish farmers wish to continue to achieve the production rates that have been attained in the past, it may be necessary to install effluent treatment.

82-001111 Wynes, D. L. and T. E. Wissing. EFFECTS OF WATER QUALITY ON FISH AND MACROINVERTEBRATE COMMUNITIES OF THE LITTLE MIAMI RIVER. *Ohio J. Sci.* 81(5-6):259-267. Sept.-Nov. 1981. SFA 27(2)
[Dep. Environ. Sci., Nichols Coll., Dudley, MA 01570]

82-001112 Yoder, C. O. THE ROLE OF FISH COMMUNITY STRUCTURE IN ASSESSING WATER QUALITY IN OHIO'S RIVERS AND STREAMS. *Ohio J. Sci.* 82(2):99. 1982. Abstract only. SFA 27(2)
[Ohio Environ. Prot. Agency, Div. Surveillance Standards, Columbus 43215]

## FISH KILLS

82-001113 Swanson, R. N. and J. H. Gillespie. ISOLATION OF INFECTIOUS PANCREATIC NECROSIS VIRUS FROM THE BLOOD AND BLOOD COMPONENTS OF EXPERIMENTALLY INFECTED TROUT. *Can. J. Fish. Aquatic Sci.* 39(1):225-228. Jan. 1982. In English with French summ. SFA 27(2)
[Dep. Microbiol., Uniformed Serv. Univ. Health Sci., Bethesda, MD 20814]

## TOXICOLOGY; BIOASSAYS

82-001114 Becker, C. D. and D. W. Crass. EXAMINATION OF PROCEDURES FOR ACUTE TOXICITY TESTS WITH THE FATHEAD MINNOW AND COAL SYNFUEL BLENDS. *Arch.*

## TOXICOLOGY; BIOASSAYS (CONTINUED)

82-001114 CONTINUED *Environ. Contam. Toxicol.* 11(1):33-40. 1982. SFA 27(2)
[Pac. Northwest. Lab., Richland, WA 99352]

82-001115 Belanger, S. E. and K. Schurr. THE EFFECTS OF ASBESTOS ON LARVAL COHO SALMON. *Ohio J. Sci.* 82(2):4. 1982. Abstract only. SFA 27(2)
[Dep. Biol. Sci., Bowling Green State Univ., Bowling Green, OH 43403]
Asbestos is a naturally occurring, fibrous mineral with substantial deposits in North America. Through the processes of weathering and human activity, asbestos fibers are released into aquatic habitats. Asbestos poses a potentially major threat to aquatic life. In order to evaluate this threat, coho salmon larvae (*Oncorhynchus kisutch*) were chosen as an experimental model. Fertilized eggs obtained from the Platte River Fish Hatchery, Michigan, were incubated under standard laboratory conditions. Upon hatching, the larvae were divided into groups of control and experimental fish. The experimental population was exposed to concentrations of asbestos similar to those reported in the Great Lakes. The experiment was terminated after 40 days. Acute mortality was comparable for both groups. Control fish displayed normal behavior and physical development. Asbestos treated fish exhibited abnormal swimming behavior and developmental aberations such as distentions of the ceolomic cavity and gross tissue hypertrophy in the gill region. Cytological examination revealed extensive tissue hyperatrophy and distortion of the lateral line organ in experimental larvae. Asbestos fibers were present in many of the tissues of treated fish. Asbestos may represent a new environmental hazard whose effects on aquatic life must be further explored.

82-001116 Cairns, M. A.; R. R. Garton and R. A. Tubb. USE OF FISH VENTILATION FREQUENCY TO ESTIMATE CHRONICALLY SAFE TOXICANT CONCENTRATIONS. *Trans. Am. Fish. Soc.* 111(1):70-77. Jan. 1982. SFA 27(2)
[U.S. EPA, 1350 Southeast Goodnight Ave., Corvallis, OR 97333]

82-001117 Colgan, P. W.; J. A. Cross and P. H. Johansen. GUPPY BEHAVIOR DURING EXPOSURE TO A SUB-LETHAL CONCENTRATION OF PHENOL. *Bull. Environ. Contam. Toxicol.* 28(1):20-27. Jan. 1982. SFA 27(2)
[Dep. Biol., Queen's Univ., Kingston, ON K7L 3N6, Canada]

82-001118 Dutta, H. M.; S. B. Lall and A. Z. Haghighi. BIOCHEMICAL AND ELECTROPHORETIC MONITORING OF SERUM PROTEIN AND ENZYMATIC ABERRATIONS IN BLUE GILLS-*LEPOMIS MACROCHIRUS*, CHALLENGED BY VARIOUS DOSES OF METHYL MERCURY CHLORIDE. *Ohio J. Sci.* 82(2):99. 1982. Abstract only. SFA 27(2)
[Dep. Biol. Sci., Kent State Univ., Kent, OH 44242]

82-001119 Hanna, P. J. EFFECTS ON SPERMATOGENESIS IN THE GUPPY *POECILIA RETICULATA* BY PROLONGED EXPOSURE TO TRIMETHYLPHOSPHATE. *Bull. Environ. Contam. Toxicol.* 28(1):28-32. Jan. 1982. SFA 27(2)
[Div. Biol. Health Sci., Deakin Univ., Victoria 3217, Australia]

82-001120 Holcombe, G. W.; G. L. Phipps and J. T. Fiandt. EFFECTS OF PHENOL, 2,4-DIMETHYLPHENOL, 2,4-DICHLOROPHENOL, AND PENTACHLOROPHENOL ON EMBRYO, LARVAL, AND EARLY-JUVENILE FATHEAD MINNOWS (*PIMEPHALES PROMELAS*). *Arch. Environ. Contam. Toxicol.* 11(1):73-78. 1982. SFA 27(2)
[U.S. EPA, Environ. Res. Lab., 6201 Congdon Blvd., Duluth, MN 55804]
Embryos of fathead minnows were more resistant to phenol, 2,4-dimethylphenol (2,4-DMP), 2,4-dichlorophenol (2,4-DCP), and pentachlorophenol (PCP) than were larval or juvenile life stages. Growth of 28-day-old fish was the most sensitive indicator of stress during exposures to phenol, 2,4-DMP, and PCP, whereas survival was the most sensitive indicator of toxic effects from 2,4-DCP exposure. Based on these effects, the estimated maximum acceptable toxicant concentration for fathead minnows in Lake Superior water lies

TOXICOLOGY; BIOASSAYS (CONTINUED)

82-001120 CONTINUED between 1,830 and 3,570 μg/L for phenol; 1,970 and 3,110 μg/L for 2,4-DMP; 290 and 460 μg/L for 2,4-DCP; and 44.9 and 73.0 μg/L for PCP.

82-001121 Hose, J. E.; J. B. Hannah; D. DiJulio; M. L. Landolt; B. S. Miller; W. T. Iwaoka and S. P. Felton. EFFECTS OF BENZO(A)PYRENE ON EARLY DEVELOPMENT OF FLATFISH. *Arch. Environ. Contam. Toxicol.* 11(2):167-171. 1982. SFA 27(2)
[Moore Lab. Zool., Occidental Coll., 1600 Campus Rd., Los Angeles, CA 90041]

82-001122 Huey, D. W.; M. C. Wooten; L. A. Freeman and T. L. Beitinger. EFFECT OF pH AND CHLORIDE ON NITRITE-INDUCED LETHALITY IN BLUEGILL (*LEPOMIS MACROCHIRUS*). *Bull. Environ. Contam. Toxicol.* 28(1):3-6. Jan. 1982. SFA 27(2)
[T.L. Beitinger: Dep. Biol. Sci., North Tex. State Univ., Denton, TX 76203]

82-001123 Khangarot, B. S. HISTOPATHOLOGICAL CHANGES IN THE BRANCHIAL APPARATUS OF *PUNTIUS SOPHORE* (HAMILTON) SUBJECTED TO TOXIC DOSES OF ZINC. *Arch. Hydrobiol.* 93(3):352-358. 1982. In English with German summ. SFA 27(2)
[Dep. Anthropol., Univ. Delhi, Delhi 110 007, India]

82-001124 Kumaraguru, A. K.; F. W. H. Beamish and H. W. Ferguson. DIRECT AND CIRCULATORY PATHS OF PERMETHRIN (NRDC-143) CAUSING HISTOPATHOLOGICAL CHANGES IN THE GILLS OF RAINBOW TROUT, *SALMO GAIRDNERI* RICHARDSON. *J. Fish Biol.* 20(1):87-91. Jan. 1982. SFA 27(2)
[Dep. Zool., Univ. Guelph, Guelph, ON N1G 2W1, Canada] Rainbow trout were exposed to sublethal concentrations of Permethrin in water (0.09, 0.18 and 0.35μg $l^{-1}$) and in food (85, 180 and 350μg $kg^{-1}$ dry diet) in 20-40 day experiments. Histological changes in the gills included epithelial separation of necrosis, mucus cell hyperplasia, clubbing of epithelial cells or hyperplasia and fusion of adjacent secondary lamellae. these changes were noted in all fish, suggesting that the pesticide or its metabolites reached the gills not only directly through the water, but also indirectly via the circulation.

82-001125 Matthiessen, P. and R. J. Roberts. HISTOPATHOLOGICAL CHANGES IN THE LIVER AND BRAIN OF FISH EXPOSED TO ENDOSULFAN INSECTICIDE DURING TSETSE FLY CONTROL OPERATIONS IN BOTSWANA. *J. Fish Dis.* 5(2):153-159. Mar. 1982. SFA 27(2)
[Cent. Overseas Pest Res., 56 Gray's Inn Rd., London WC1X 8LU, England]

82-001126 Miller, T. G. and W. C. Mackay. RELATIONSHIP OF SECRETED MUCUS TO COPPER AND ACID TOXICITY IN RAINBOW TROUT. *Bull. Environ. Contam. Toxicol.* 28(1):68-74. Jan. 1982. SFA 27(2)
[Dep. Zool., Univ. Alberta, Edmonton, AB T6G 2E9, Canada]

82-001127 Muramoto, S. INFLUENCE OF COMPLEXANS (NTA, EDTA) ON THE TOXICITY OF TRIVALENT CHROMIUM (CHROMIUM CHLORIDE, SULFATE) AT LEVELS LETHAL TO FISH. *J. Environ. Sci. Health A Environ. Sci. Eng. (Marcel Dekker, Inc., N.Y.)* 16(6):605-610. 1981. SFA 27(2)
[Inst. Agric. Biol. Sci., Okayama Univ., Kurashiki 710, Japan]

TOXICOLOGY; BIOASSAYS (CONTINUED)

82-001128 Muramoto, S. REDUCTIONS OF Cd IN Cd-CONTAMINATED FISH BY LONG-TERM EXPOSURE TO EDTA OR FRESH-WATER. *J. Environ. Sci. Health A Environ. Sci. Eng. (Marcel Dekker, Inc., N.Y.)* 17(1):67-74. 1982. SFA 27(2)
[Inst. Agric. Biol. Sci., Okayama Univ., Kurashiki 710, Japan]

82-001129 Nava, M. E. and F. R. Engelhardt. INDUCTION OF MIXED FUNCTION OXIDASES BY PETROLEUM IN THE AMERICAN EEL, *ANGUILLA ROSTRATA*. *Arch. Environ. Contam. Toxicol.* 11(2):141-145. 1981. SFA 27(2)
[F.R. Engelhardt: Dep. Biol., Univ. Ottawa, Ottawa, ON K1N 6N5, Canada]

82-001130 Niimi, A. J. and C. A. McFadden. UPTAKE OF SODIUM PENTACHLOROPHENATE (NaPCP) FROM WATER BY RAINBOW TROUT (*SALMO GAIRDNERI*) EXPOSED TO CONCENTRATIONS IN THE ng/L RANGE. *Bull. Environ. Contam. Toxicol.* 28(1):11-19. Jan. 1982. SFA 27(2)
[Great Lakes Biolimnol. Lab., Can. Cent. Inland Waters, 867 Lakeshore Rd., Burlington, ON L7R 4A6, Canada]

82-001131 Nystrom, R. R. and G. Post. CHRONIC EFFECTS OF AMMONIA-STRIPPED OIL SHALE RETORT WATER ON FISHES, BIRDS, AND MAMMALS. *Bull. Environ. Contam. Toxicol.* 28(3):271-276. Mar. 1982. SFA 27(2)
[Dep. Fish. Wildl. Biol., Colo. State Univ., Fort Collins 80523]

82-001132 Oikari, A. O. J. and T. Nakari. KRAFT PULP MILL EFFLUENT COMPONENTS CAUSE LIVER DYSFUNCTION IN TROUT. *Bull. Environ. Contam. Toxicol.* 28(3):266-270. Mar. 1982. SFA 27(2)
[Dep. Zool., Div. Physiol., Univ. Helsinki, SF-00100 Helsinki 10, Finland]

82-001133 Payne, J. F. METABOLISM OF COMPLEX MIXTURES OF OIL SPILL SURFACTANT COMPOUNDS BY A REPRESENTATIVE TELEOST (*SALMO GAIRDNERI*), CRUSTACEAN (*CANCER IRRORATUS*), AND MOLLUSC (*CHLAMYS ISLANDICUS*). *Bull. Environ. Contam. Toxicol.* 28(3):277-280. Mar. 1982. SFA 27(2)
[Res. Resour. Serv., Dep. Fish. Oceans, P.O. Box 5667, St. John's, NF A1C 5X1, Canada]

82-001134 Reichert, W. L. and U. Varanasi. METABOLISM OF ORALLY ADMINISTERED NAPHTHALENE IN SPAWNING ENGLISH SOLE (*PAROPHYRS VETULUS*). *Environ. Res.* 27(2):316-324. Apr. 1982. SFA 27(2)
[NMFS, 2725 Montlake Blvd. East, Seattle, WA 98112]

82-001135 Ridlington, J. W.; D. E. Chapman; B. L. Boese and V. G. Johnson. PETROLEUM REFINERY WASTEWATER INDUCTION OF THE HEPATIC MIXED-FUNCTION OXIDASE SYSTEM IN PACIFIC STAGHORN SCULPIN. *Arch. Environ. Contam. Toxicol.* 11(1):123-127. 1982. SFA 27(2)
[Northrop Serv., Inc., 200 S.W. 35th Street, Corvallis, OR 97330]

82-001136 Schultz, M. E. and R. J. Schultz. INDUCTION OF HEPATIC TUMORS WITH 7, 12-DIMETHYLBENZ[A]ANTHRACENE IN TWO SPECIES OF VIVIPAROUS FISHES (GENUS *POECILIOPSIS*). *Environ. Res.* 27(2):337-351. Apr. 1982. SFA 27(2)
[Biol. Sci. Group, Univ. Conn., Storrs 06268]

82-001137 Shubat, P. J.; S. H. Poirier; M. L. Knuth and L. T. Brooke. ACUTE TOXICITY OF TETRACHLOROETHYLENE AND TETRACHLOROETHYLENE WITH DIMETHYLFORMAMIDE TO RAINBOW TROUT (*SALMO GAIRDNERI*). *Bull. Environ.*

TOXICOLOGY; BIOASSAYS (CONTINUED)

82-001137 CONTINUED *Contam. Toxicol.* 28(1):7-10. Jan. 1982. SFA 27(2)
[Cent. Lake Superior Environ. Stud., Univ. Wis., Superior 54880]

82-001138 Singh, B. B. and A. S. Narain. ACUTE TOXICITY OF THIODAN TO CATFISH (*HETEROPNEUSTES FOSSILIS*). *Bull. Environ. Contam. Toxicol.* 28(1):122-127. Jan. 1982. SFA 27(2)
[Dep. Zool., Univ. Gorakhpur, Gorakhpur 273001, India]

82-001139 Solangi, M. A. and R. M. Overstreet. HISTOPATHOLOGICAL CHANGES IN TWO ESTUARINE FISHES, *MENIDIA BERYLLINA* (COPE) AND *TRINECTES MACULATUS* (BLOCH AND SCHNEIDER), EXPOSED TO CRUDE OIL AND ITS WATER-SOLUBLE FRACTIONS. *J. Fish Dis.* 5(1):13-35. Jan. 1982. SFA 27(2)
[R.M. Overstreet: Gulf Coast Res. Lab., Ocean Springs, MS 39564]

82-001140 Solbakken, J. E.; A. H. Knap and K. H. Palmork. DISPOSITION OF (9-$^{14}$C) PHENANTHRENE IN A SUBTROPICAL MARINE TELEOST (*HAEMULON SCIURUS*). *Bull. Environ. Contam. Toxicol.* 28(3):285-289. Mar. 1982. SFA 27(2)
[Inst. Mar. Res., Nordnesparken 2, 5011-Bergen, Norway]

82-001141 Sullivan, J. R. and J. J. Delfino. THE DETERMINATION OF MERCURY IN FISH. *J. Environ. Sci. Health A Environ. Sci. Eng. (Marcel Dekker, Inc. N.Y.)* 17(2):265-275. 1982. SFA 27(2)
[J. J. Delfino: Lab. Hygiene, 465 Henry Mall, Univ. Wis., Madison 53706]

82-001142 Szeto, S. Y. and S. B. Holmes. THE LETHAL TOXICITY OF MATACIL ® 1.8F TO RAINBOW TROUT AND ITS *IN VIVO* METABOLISM. *J. Environ. Sci. Health B Pestic. Food Contam. Agric. Wastes (Marcel Dekker, Inc., N.Y.)* 17(1):51-61. 1982. SFA 27(2)
[Res. Stn., Agric. Can., 6660 N.W. Marine Dr., Vancouver, BC V6T 1X2, Canada] Fingerling rainbow trout (*Salmo gairdneri* Richardson) were used to determine the lethal toxicity of Matacil ® 1.8F and Matacil ® 1.8D ready-to-use formulations. The 96-h LC$_{50}$s were 21.3 mg/ℓ for water-based Matacil ® 1.8 F; 29.1 mg/ℓ for oil-based Matacil ® 1.8 F; and 0.36 mg/ℓ for Matacil ® 1.8D. Aminocarb (4-dimethylamino-m-tolyl N-methylcarbamate) and MA (4-methylamino-m-tolyl N-methylcarbamate) were detected in fish tissue 96h after exposure. More than 50% of the total residue (Aminocarb + MA) were the parent compound. The bioaccumulation ratio ranged from 1.70 to 3.32 at different concentrations of aminocarb. Both aminocarb and MA were rapidly eliminated after the fish had been transferred to clean water; the total residue declined by more than 90% in 72h and became non-detectable in 96h.

82-001143 Taylor, M. C.; A. Demayo and K. W. Taylor. EFFECTS OF ZINC ON HUMANS, LABORATORY AND FARM ANIMALS, TERRESTRIAL PLANTS, AND FRESHWATER AQUATIC LIFE. *Crit. Rev. Environ. Control* 12(2):133-181. 1982. SFA 27(2)
[Inland Waters Dir., Environ. Conserv. Serv., Dep. Environ., Ottawa, ON, Canada]

82-001144 Thomas, P.; M. Bally and J. M. Neff. ASCORBIC ACID STATUS OF MULLET, *MUGIL CEPHALUS* LINN., EXPOSED TO CADMIUM. *J. Fish Biol.* 20(2):183-196. Feb. 1982. SFA 27(2)

TOXICOLOGY; BIOASSAYS (CONTINUED)

82-001144 CONTINUED
[Univ. Tex., Mar. Sci. Inst., Port Aransas 78373] The effects of acute and chronic cadmium exposures on ascorbic acid concentrations and cadmium accumulation in the tissues of juvenile mullet, *Mugil cephalus*, are described. Hepatic ascorbic acid reserves were maintained in untreated mullet fed a diet containing ascorbate, but decreased 60% in individuals exposed to 10mg Cd $l^{-1}$ for six weeks. Ascorbic acid depletion was accompanied by a massive accumulation of cadmium in the liver. Similar changes were found in gill tissue. In contrast, ascorbic acid concentrations were largely unaffected in kidney tissue which had a limited capacity to accumulate the metal. There were marked fluctuations of ascorbic acid levels in the brain. Only small amounts of cadmium were accumulated by this tissue. These results indicate that in mullet liver, gill and brain ascorbic acid stores may be depleted during chronic cadmium poisoning.

82-001145 Voss, Sh. D.; D. W. Shelton and J. D. Hendricks. EFFECTS OF DIETARY AROCLOR 1254 AND CYCLOPROPENE FATTY ACIDS ON HEPATIC ENZYMES IN RAINBOW TROUT. *Arch. Environ. Contam. Toxicol.* 11(1):87-91. 1982. SFA 27(2)
[Dep. Food Sci. Technol., Oreg. State Univ., Corvallis 97331]

82-001146 Wakabayashi, M.; M. Kikuchi; A. Sato and T. Yoshida. [THE RELATIONSHIP BETWEEN EXPOSURE CONCENTRATION AND BIOACCUMULATION OF SURFACTANTS.] *Bull. Jpn. Soc. Sci. Fish.* 47(10):1383-1387. Oct. 1981. In Japanese with English summ. SFA 27(2)
[Tokyo Metro. Res. Inst. Environ. Prot., 7-1, Yurakucho-2, Chiyoda, Tokyo 100, Japan]

82-001147 Watson, T. A.; P. A. G. Tilley; B. A. McKeown and G. H. Geen. *IN VITRO* EFFECTS OF ACEPHATE ON CARBONIC ANHYDRASE ACTIVITY IN THE BLOOD AND GILLS OF RAINBOW TROUT, *SALMO GAIRDNERI*. *J. Environ. Sci. Health B Pestic. Food Contam. Agric. Wastes (Marcel Dekker, Inc., N.Y.)* 17(1):63-75. 1982. SFA 27(2)
[B.C. Hydro, 555 W. Hastings St., EG-25, Box 12121, Vancouver, BC V6B 4T6, Canada] Acephate, a water-soluble organophosphate pesticide used to control terrestrial insect pests, may enter aquatic ecosystems in the course of its use and adversely affect fish populations. The *in vitro* effects of this insecticide on gill and red blood cell (RBC) carbonic anyhdrase (CA) activity in rainbow trout were investigated over a range of 100 mg/l (0.55 mM) to 50,000 mg/l (273 mM) to assess the manner in which acephate might affect respiratory capacity in exposed fish. Concentrations required to produce 50% inhibition of CA activity in the gill and RBC preparations were 38,000 mg/l (207 mM) and 8,900 mg/l (48 mM) respectively. The toxic action of acephate may be related to inhibition of CA activity in the blood and gills with resultant disturbances of respiratory capacity and salt balance.

82-001148 Weis, P. and J. S. Weis. TOXICITY OF THE PCBs AROCLOR 1254 AND 1242 TO EMBRYOS AND LARVAE OF THE MUMMICHOG, *FUNDULUS HETEROCLITUS*. *Bull. Environ. Contam. Toxicol.* 28(3):298-304. Mar. 1982. SFA 27(2)
[Dep. Anat., Coll. Med. Dent., Newark, NJ 07103]

82-001149 Wildish, D. J. and J. K. Elner. ABSENCE OF LONG-TERM CHANGES IN THE MICROBIOLOGY OF FRESHWATER PONDS TREATED WITH MATACIL. *Can. Tech. Rep. Fish. Aquatic Sci.* No. 1049. iii + 17p. Jan. 1982. In English with French summ. SFA 27(2)
[Biol. Stn., St. Andrews, NB E0G 2X0, Canada]

## TOXICOLOGY; BIOASSAYS (CONTINUED)

82-001150 Zakitis, L. H. and E. M. McCray, Jr. GAS-CHROMATOGRAPHIC ANALYSIS OF RESIDUES OF PIRIMIPHOS-METHYL IN WATER, FISH, AND SNAILS. *Bull. Environ. Contam. Toxicol.* 28(3):334-340. Mar. 1982. SFA 27(2)

[Cent. Infectious Dis., Cent. Dis. Control, Publ. Health Serv., U.S. Dep. Health Human Serv., Atlanta, GA 30333]

## RESEARCH AND MANAGEMENT-GENERAL

82-001151 Armantrout, N. B. BORAX LAKE CHUB: REVIEW OF RECENT EVENTS. *Proc. Desert Fishes Counc.* 12:69-70. 1980(1981). Abstract only. SFA 27(2)

[Bur. Land Manage., Portland, OR]

82-001152 Armantrout, N. B. and M. Crouse. WHITEHORSE CUTTHROAT TROUT. *Proc. Desert Fishes Counc.* 12:25-28. 1980(1981). SFA 27(2)

[Bur. Land Manage., Portland, OR] The Whitehorse trout is an undescribed subspecies of cutthroat trout (*Salmo clarki* Richardson) related to the Snake River cutthroat, native to the Whitehorse Basin of SE Oregon. Limited access has helped preserve the species from extinction through hybridization. The Bureau of Land Management, with close cooperation of the Oregon Department of Fish and Wildlife and the Whitehorse Ranch, is implementing a habitat management plan to protect the habitat of the trout. The trout has been successfully introduced into the adjoining Alvord Basin.

82-001153 Aron, W. FISHERY SCIENCE, UNCERTAINTY AND RESPONSIBILITY. *Fisheries (Bull. Am. Fish. Soc.)* 7(1):6-8. Jan.-Feb. 1982. SFA 27(2)

[NMFS, Northwest and Alaska Fish. Cent., Seattle, WA]

82-001154 Berst, A. H. and R. C. Simon. INTRODUCTION TO THE PROCEEDINGS OF THE 1980 STOCK CONCEPT INTERNATIONAL SYMPOSIUM (STOCS). *Can. J. Fish. Aquatic Sci.* 38(12):1457-1458. Dec. 1981. SFA 27(2)

[30 Fashion Roseway, Suite 203E, Willowdale, ON M2N 6B4, Canada]

82-001155 Booke, H. E. THE CONUNDRUM OF THE STOCK CONCEPT--ARE NATURE AND NURTURE DIFINABLE IN FISHERY SCIENCE? *Can. J. Fish. Aquatic Sci.* 38(12):1479-1480. Dec. 1981. In English with French summ. SFA 27(2)

[Mass. Coop. Fish. Res. Unit, Dep. For. Wildl. Manage., Univ. Mass., Amherst 01003]

82-001156 Erdheim, E. THE WAKE OF THE SNAIL DARTER: INSURING THE EFFECTIVENESS OF SECTION 7 OF THE ENDANGERED SPECIES ACT. *Ecol. Law Q.* 9(4):629-682. 1981. SFA 27(2)

[NOAA, Washington, DC]

82-001157 Gaudet, J.-L., (ed.) REPORT OF THE TECHNICAL CONSULTATION ON THE ALLOCATION OF FISHERY RESOURCES. *EIFAC Tech. Pap.* No. 38. vii + 45p. 1981. SFA 27(2)

[FAO of the UN, Rome, Italy]

82-001158 Johnson, J. E. THE RESURRECTION OF SAN BERNARDINO. *Proc. Desert Fishes Counc.* 12:92-93 1980(1981). In English and Spanish. Abstract only. SFA 27(2)

[U.S. FWS, Albuquerque, NM]

## RESEARCH AND MANAGEMENT-GENERAL (CONTINUED)

82-001159 Loftus, K. H. WHERE ARE WE NOW? *Can. J. Fish. Aquatic Sci.* 38(12):1464-1465. Dec. 1981. SFA 27(2)
[Ontario Minist. Nat. Resour., Toronto, ON, Canada]

82-001160 MacLean, J. A. and D. O. Evans. THE STOCK CONCEPT, DISCRETENESS OF FISH STOCKS, AND FISHERIES MANAGEMENT. *Can. J. Fish. Aquatic Sci.* 38(12):1889-1898. Dec. 1981. In English with French summ. SFA 27(2)
[Ontario Minist. Nat. Resour., Res. Sect., Fish. Br., Maple, ON L0J 1E0 Canada]

82-001161 Maitland, P. S.; H. A. Regier; G. Power and N. A. Nilsson. A WILD SALMON, TROUT, AND CHAR WATCH: AN INTERNATIONAL STRATEGY FOR SALMONID CONSERVATION. *Can. J. Fish. Aquatic Sci.* 38(12):1882-1888. Dec. 1981. In English with French summ. SFA 27(2)
[Inst. Terrestrial Ecol., 78 Craighall Rd., Edinburgh, Scotland]

82-001162 Meefe, G. K. CURRENT STATUS OF ENDANGERED TOPMINNOWS (POECILIIDAE: *POECILIOPSIS*). *Proc. Desert Fishes Counc.* 12:107-108. 1980(1981). In English and Spanish. Abstract only. SFA 27(2)
[Dep. Zool., Ariz. State Univ., Tempe 85281]

82-001163 Moyle, P. B. and J. J. Cech, Jr. FISHES: AN INTRODUCTION TO ICHTHYOLOGY. xiv + 593p. 1982. Available @ $29.95 from Prentice-Hall, Inc., Englewood Cliffs, NJ 07632. SFA 27(2)
This book is designed to serve as a text in classes in fish biology.--RS

82-001164 Rigler, F. H. THE RELATION BETWEEN FISHERIES MANAGEMENT AND LIMNOLOGY. *Trans. Am. Fish. Soc.* 111(2):121-132. Mar. 1982. SFA 27(2)
[Dep. Biol., McGill Univ., Montreal, PQ H3A 1B1, Canada]

82-001165 Rinne, J. N. RESEARCH ON TWO NATIVE SOUTHWESTERN TROUTS AND ITS MANAGEMENT IMPLICATIONS. *Proc. Desert Fishes Counc.* 12:112-118. 1980(1981). In English and Spanish. Abstract only. SFA 27(2)
[Rocky Mountain For. Range Exp. Stn., Tempe, AZ 85281]

82-001166 Senanayake, F. R. and P. B. Moyle. CONSERVATION OF FRESHWATER FISHES OF SRI LANKA. *Biol. Conserv.* 22(3):181-195. Mar. 1982. SFA 27(2)
[41 Gregorys Rd., Colombo 7, Sri Lanka] Sri Lanka supports a diverse fauna of freshwater fishes, 24% of which are endemic. A survey of the island's streams indicated that a number of the endemic fishes are threatened with extinction and others are depleted due to the interaction of deforestation, urbanization, gem mining, pesticides, exploitation, water diversions, and introductions of exotic species. It is clear that these declines should be halted for ethical, economic, and ecological reasons. Methods proposed to reverse the declines include captive breeding, better watershed management, translocation, and regulation of fisheries, especially that for aquarium fishes. The depauperate Second Peneplain is proposed as a site for translocation of endangered species.

82-001167 Sousa, R. J. A NATIONAL OVERVIEW OF FISHERY RESEARCH FUNDED BY THE DINGELL-JOHNSON PROGRAM. *Fisheries (Bull. Am. Fish. Soc.)* 7(1):3-6. Jan.-Feb. 1982. SFA 27(2)
[U.S. Fish Wildl. Serv., Washington, DC 20240]

RESEARCH AND MANAGEMENT-GENERAL (CONTINUED)

82-001168 Spangler, G. R.; A. H. Berst and J. F. Koonce. PERSPECTIVES AND POLICY RECOMMENDATIONS ON THE RELEVANCE OF THE STOCK CONCEPT TO FISHERY MANAGEMENT. *Can. J. Fish Aquatic Sci.* 38(12):1908-1914. Dec. 1981. In English with French summ. SFA 27(2)
[Univ. Minn., St. Paul 55108]

82-001169 Utter, F. M. BIOLOGICAL CRITERIA FOR DEFINITION OF SPECIES AND DISTINCT INTRASPECIFIC POPULATIONS OF ANADROMOUS SALMONIDS UNDER THE U.S. ENDANGERED SPECIES ACT OF 1973. *Can. J. Fish. Aquatic Sci.* 38(12):1626-1635. Dec. 1981. In English with French summ. SFA 27(2)
[NMFS, 2725 Montlake Blvd. East, Seattle, WA 98112]

## HABITAT ALTERATIONS

82-001170 Becker, C. D.; D. H. Fickeisen and J. C. Montgomery. ASSESSMENT OF IMPACTS FROM WATER LEVEL FLUCTUATIONS ON FISH IN THE HANFORD REACH, COLUMBIA RIVER. *Battelle Pac. Northwest Lab.* PNL-3813. 53p. May 1981. SFA 27(2)
[Battelle Pac. Northwest Lab., Richland, WA]

82-001171 Blackie, J. R.; E. D. Ford; J. E. M. Horne; D. J. J. Kinsmore; F. T. Last and P. Moorhouse. ENVIRONMENTAL EFFECTS OF DEFORESTATION: AN ANNOTATED BIBLIOGRAPHY. *Freshwater Biol. Assoc. Occas. Publ.* No. 10. 173p. 1980. SFA 27(2)
[Inst. Hydrol., Freshwater Biol. Lab., Ambleside, England]

82-001172 Clugston, J. P. and E. D. Prince. ENVIRONMENTAL IMPACTS OF PUMPED STORAGE HYDROELECTRIC DEVELOPMENT. *Symp. Proc. Unified River Management (Am. Water Resour. Assoc.)* p. 580-587. 1980. SFA 27(2)
[U.S. FWS, Southeast Reservoir Invest., 206 Highway 123 By-Pass, Clemson, SC 29631] Pumped storage hydroelectric development is an important method of electrical power production in the United States. Pumped storage is unique because it provides a means of converting excess electrical energy during periods of low demand to a storable form which can be reconverted to electricity during times of peak needs. There are now about 29 developed pumped storage plants in the United States, and over 1,000 potential sites have been identified. Environmental concerns of pumped storage development were discussed by about 70 biologists and engineers from throughout the United States at a recent workshop in Clemson, South Carolina. This paper synthesizes information from the workshop and selected recent publications in order to help those involved in multipurpose river basin planning and management gain a better understanding of environmental alterations caused by pumped storage operations. This information will also be helpful in developing ways to meet environmental requirements set forth by regulatory agencies.

82-001173 Courtois, L. A. RESPONSE OF THE MOHAVE CHUB, *GILA BICOLOR MOHAVENSIS*, TO DEWATERING OF AN ARTIFICAL IMPOUNDMENT. *Calif. Fish Game* 68(1):61-62. Jan. 1982. SFA 27(2)
[Calif. Dep. Fish Game, 1701 Nimbus Rd., Rancho Cordova 95670]

HABITAT ALTERATIONS (CONTINUED)

82-001174 Davies, R. M. PROPOSED METHODOLOGY FOR DETERMINING ROAD CONSTRUCTION AND POPULATION CENTER GROWTH IMPACTS AND THEIR SIGNIFICANCE ON DESERT FISHES AND AQUATIC INVERTEBRATES. *Proc. Desert Fishes Counc.* 12:29-40. 1980(1981). SFA 27(2)
[HDR Sci., 804 Anacapa St., Santa Barbara, CA 93101]

82-001175 Fast, A. W.; L. H. Bottroff and R. L. Miller. LARGEMOUTH BASS, *MICROPTERUS SALMOIDES*, AND BLUEGILL, *LEPOMIS MACROCHIRUS*, GROWTH RATES ASSOCIATED WITH ARTIFICIAL DESTRATIFICATION AND THREADIN SHAD, *DOROSOMA PETENENSE*, INTRODUCTIONS AT EL CAPITAN RESERVOIR, CALIFORNIA. *Calif. Fish Game* 68(1):4-20. Jan. 1982. SFA 27(2)
[Hawaii Inst. Mar. Biol., Univ. Hawaii, P.O. Box 1346, Kaneohe 96744]
Growth rates of age 1 largemouth bass and bluegill decreased following introduction of threadfin shad in 1958. Decreased growth is attributed to competition for food between age 1 gamefish and threadfin shad. Growth rates of older largemouth bass and bluegill generally increased following the threadfin shad introduction, due to increased forage provided by threadfin shad. Growth rates of age 1 largemouth bass and bluegill increased from 1964 through 1966 during artificial destratification, possibly due to decreased competition with threadfin shad. Growth rate trends of older largemouth bass and bluegill during destratification were less distinct, but an initial increase during the first year or two of destratification was followed by declining growth rates for largemouth bass.

82-001176 Minckley, W. L. CHANGES IN THE CUATRO CIENEGAS BASIN, COAHUILA, MEXICO, 1958-79. *Proc. Desert Fishes Counc.* 12:109. 1980(1981). In English and Spanish. Abstract only. SFA 27(2)
[Dep. Zool., Ariz. State Univ., Tempe 85281]

82-001177 Platts, W. S. SHEEP AND CATTLE GRAZING STRATEGIES ON RIPARIAN-STREAM ENVIRONMENTS. In *Proc. Wildlife-Livestock Relationships Symp., Univ. Idaho*. 1981. Available from USDA, Intermountain For. Range Exp. Stn., 507 25th St., Ogden, UT 84401. SFA 27(2)
Research studies involving the effects of cattle and sheep grazing strategies on stream riparian habitat are discussed. Initial results indicate that herded sheep grazing may have little effect on streams and the riparian environment. The effects of cattle grazing first appear on the streambanks and riparian vegetation. Habitat alteration occurs at utilization rates of 65% or more, and alteration is insignificant when utilization is less than 25 percent. Continued research is needed to identify grazing strategies compatible with riparian environments, and to develop new grazing strategies.

82-001178 Smith, B. W.; G. R. Hooper and C. S. Lawson. OBSERVATION OF FISH ATTRACTION TO IMPROVED ARTIFICIAL MIDWATER STRUCTURES IN FRESHWATER. *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:404-409. 1980[1981]. SFA 27(2)
[Ala. Game Fish Div., Fish. Sect., 64 N. Union St., Montgomery 36130]
Artificial midwater structures constructed primarily with fiberglass panels and automobile tires were placed in an oligotrophic storage reservoir to determine the extent of fish association with these structures. SCUBA observations were used to evaluate the effectiveness of the structures. Comparisons were made between these and previous structures used by Reeves et al. (1977). Six species of game fish were attracted; however, Alabama spotted bass (*Micropterus punctulatus henshalli*) and bluegill sunfish (*Lepomis macrochirus*) were the predominant species. Concentrations of harvestable spotted bass were noted throughout most of the summer months.

## HABITAT ALTERATIONS (CONTINUED)

82-001179 Wright, D. G. A DISCUSSION PAPER ON THE EFFECTS OF EXPLOSIVES ON FISH AND MARINE MAMMALS IN THE WATERS OF THE NORTHWEST TERRITORIES. *Can. Tech. Rep. Fish. Aquatic Sci.* No. 1052. v + 16p. Feb. 1982. SFA 27(2)
[Dep. Fish. Oceans, Winnipeg, MB R3T 2N6, Canada]

## HARVEST, CREEL CENSUS, ETC.

82-001180 Anderson, L. G. OPTIMAL UTILIZATION OF FISHERIES WITH INCREASING COSTS OF EFFORT. *Can. J. Fish. Aquatic Sci.* 39(1):211-214. Jan. 1982. In English with French summ. SFA 27(2)
[Coll. Mar. Stud., Univ. Del., Newark 19711]

82-001181 Freeze, M. and S. Henderson. ECONOMIC EVALUATION OF THE WILD COMMERCIAL FISHERY IN ARKANSAS--1JULY 1978 TO 30 JUNE 1979. *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:372-378. 1980[1981]. SFA 27(2)
[Ark. Game Fish Comm., Little Rock 72205]

82-001182 McHugh, J. L. MARINE FISHERIES OF DELAWARE. *NOAA Fish. Bull.* 79(4):575-599. Oct. 1981. SFA 27(2)
[Mar. Sci. Res. Cent., State Univ. N.Y., Stoney Brook 11794]

82-001183 Smith, J. E. CATCH AND EFFORT STATISTICS OF THE CANADIAN GROUNDFISH FISHERY ON THE PACIFIC COAST IN 1980. *Can. Tech. Rep. Fish. Aquatic Sci.* No. 1032. iv + 90p. Nov. 1981. In English with French summ. SFA 27(2)
[Dep. Fish. Oceans, Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada]

82-001184 Thompson, P. C. THE ECONOMIC PERFORMANCE OF THE COMMERCIAL SKIFF FISHERY IN WESTERN CANADA. *Can. Tech. Rep. Fish. Aquatic Sci.* No. 1037. v + 21p. Dec. 1981. In English with French summ. SFA 27(2)
[Dep. Fish. Oceans, Winnipeg, MB R3T 2N6, Canada]

82-001185 Ward, W. D.; L. J. Hoines and G. D. Nye, (eds.). 1979-80 FISHERIES STATISTICAL REPORT. *Wash. Dep. Fish. Fish. Stat. Rep.* ii + 70p. 1981. SFA 27(2)

82-001186 Weithman, A. S. and M. A. Haas. SOCIOECONOMIC VALUE OF THE TROUT FISHERY IN LAKE TANEYCOMO, MISSOURI. *Trans. Am. Fish. Soc.* 111(2):223-230. Mar. 1982. SFA 27(2)
[Fish Wildl. Res. Cent., Mo. Dep. Conserv., Columbia 65201]

## FISH CONTROL AND REMOVAL

82-001187 Filipek, S. SURVEY AND EVALUATION OF ARKANSAS' CHEMICAL REHABILITATION OF LAKES. *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:181-192. 1980[1981]. SFA 27(2)
[Ark. Game Fish Comm., Little Rock 72205] Arkansas has carried out an extensive program of chemical rehabilitation of lakes and reservoirs since 1953. In the 27-year period since the first renovation, over 220 major lakes

## FISH CONTROL AND REMOVAL (CONTINUED)

82-001187 CONTINUED and impoundments have been treated with 94,445 kg of 5 percent equivalent rotenone powder and 37,123 liters of 5 percent liquid rotenone. A total of 18,839 ha have been treated on these lakes. Chemical rehabilitation may be required every 3 to 5 years on some lakes in Arkansas. Gizzard shad (*Dorosoma cepedianum*) is usually the problem species but often sunfish, particularly *Lepomis* spp., and other species of fish overpopulate, stunt and requrie thinning. Thirteen chemical renovations on 7 state lakes were evaluated. In 11 cases, desired goals were achieved. Generally, large gizzard shad populations can be significantly decreased by renovation with the black bass population often receiving the greatest benefit. The results of this study overwhelmingly support the Arkansas Game and Fish Commission's policy of active fishery management utilizing chemical reclamation as a major tool.

## MARKING AND TAGGING

82-001188 Behrens Yamada, S. and T. J. Mulligan. STRONTIUM MARKING OF HATCHERY REARED COHO SALMON, *ONCORHYNCHUS KISUTCH* WALBAUM, IDENTIFICATION OF ADULTS. *J. Fish Biol.* 20(1):5-9. Jan. 1982. SFA 27(2)
[Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada] Hatchery-raised coho salmon were marked with stable strontium prior to their release to sea. Returning marked spawners were correctly identified after 18 months at sea by measuring the Strontium (Sr) concentration of the central region of their scales and vertebrae.

82-001189 Hay, D. E. RETENTION OF TAGS AND SURVIVAL OF TAGGED PACIFIC HERRING HELD IN CAPTIVITY. *Can. Tech. Rep. Fish. Aquatic Sci.* No. 1050. v + 15p. Dec. 1981. In English with French summ. SFA 27(2)
[Dep. Fish. Oceans, Resour. Serv. Br., Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada] Herring were tagged and maintained in captivity for 18 months to determine the effects of tagging on survival and estimate the rate of retention of tags. Initial mortality within 2 months of tagging was low, varying between 2% and 18% among 3 separate groups. Lowest initial mortality occurred among one group held in captivity the longest (14 months) prior to tagging. After 6 months there was no evidence of reduced viability of tagged fish compared to untagged fish held in the same enclosures; comparison of length-weight regressions and gonosomatic indices between tagged and untagged fish showed no significant differences. Mortality continued gradually throughout the duration of the test but increased suddenly after approximately 16 months during an outbreak of disease. Several months after the start of the test loose tags lost from live herring were found on tank bottoms. The frequency of loose or unrecovered tags (loose tage that were lost in drains) was estimated at 9% after 6 months and 22-26% after 18 months. Mortality due solely to tagging is probably not substantial within the first year after tagging, however, the rate of tag loss from fish is high. Special attention to this problem may be warrented in the design of future tagging and tag recovery programs.

82-001190 MacLennan, D. N. THE THEORY OF SOLID SPHERES AS SONAR CALIBRATION TARGETS. *Scott. Fish. Res. Rep.* No. 22. 17p. 1981. SFA 27(2)
[Mar. Lab., Aberbeen, Scotland]

82-001191 Persat, H. PHOTOGRAPHIC IDENTIFICATION OF INDIVIDUAL GRAYLING, *THYMALLUS THYMALLUS*, BASED ON THE DISPOSITION OF BLACK DOTS AND SCALES. *Freshwater Biol.* 12(1):97-101. Feb. 1982. SFA 27(2)
[Dep. Biol. Anim. Ecol., Univ. Lyon I, F-69622 Villeurbanne Cedex, France] The flanks of grayling are generally studded with black dots which vary in number. The number and position of these dots are well-defined for each

## MARKING AND TAGGING (CONTINUED)

82-001191 CONTINUED individual and make it possible to identify each fish. In some cases, as when there are very few dots or none at all, it is necessary to make use of other features such as the general dispositon of the scales. The best method for recording these characters is by photographing each fish. When recaptured, a fish can be recognized by comparing photographs. The number and position of dots on their lines can be sorted by a computer. Ultimate confirmation is given by comparing the most likely photographs once they have been selected by computer.

82-001192 Ross, M. J. and C. F. Kleiner. SHIELDED-NEEDLE TECHNIQUE FOR SURGICALLY IMPLANTING RADIO-FREQUENCY TRANSMITTERS IN FISH. *Prog. Fish-Cult.* 44(1):41-43. Jan. 1982. SFA 27(2)
[Univ. Minn., Dep. Ecol. Behav. Biol., Minneapolis 55455]

82-001193 Wilson, T. C. AN UNDERWATER FISH TAGGING METHOD. *Calif. Fish Game* 68(1):47-50. Jan. 1982. SFA 27(2)
[Pac. Gas Elec. Co., Dep. Eng. Res., 3400 Crow Canyon Rd., San Ramon, CA 94583]

## STOCKING AND INTRODUCTIONS

82-001194 Fraser, J. M. COMPARATIVE SURVIVAL AND GROWTH OF PLANTED WILD, HYBRID, AND DOMESTIC STRAINS OF BROOK TROUT (*SALVELINUS FONTINALIS*) IN ONTARIO LAKES. *Can. J. Fish. Aquatic Sci.* 38(12):1672-1684. Dec. 1981. In English with French summ. SFA 27(2)
[Ontario Minist. Nat. Resour., Box 50, Maple, ON L0J 1E0, Canada]

82-001195 Helfrich, L. A. and W. T. Kendall. MOVEMENTS OF HATCHERY-REARED RAINBOW, BROOK, AND BROWN TROUT STOCKED IN A VIRGINIA MOUNTAIN STREAM. *Prog. Fish-Cult.* 44(1):3-7. Jan. 1981. SFA 27(2)
[Dep. Fish. Wildl. Sci., VPI&SU, Blacksburg, VA 24061]

82-001196 Hendrickson, D. NOTES ON THE DISTRIBUTION OF INTRODUCED FISHES IN PACIFIC DRAINAGES OF NORTHWESTERN MÉXICO. *Proc. Desert Fishes Counc.* 12:89. 1980(1981). In English and Spanish. Abstract only. SFA 27(2)
[Dep. Zool., Ariz. State Univ., Tempe 85281]

82-001197 Kendall, W. T. and L. A. Helfrich. DISPERSION PATTERNS OF HATCHERY-REARED RAINBOW TROUT STOCKED IN A VIRGINIA MOUNTAIN STREAM. *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:318-329. 1980[1981]. SFA 27(2)
[Dep. Fish. Wildl. Sci., VPI&SU, Blacksburg, VA 24061] Dispersion patterns of 578 tagged rainbow trout stocked into pool and riffle habitats of Big Stony Creek, Giles County, Virginia, were determined for voluntary tag returns and a creel census of fishermen during the 1979-80 trout fishing season. Twenty-two percent of the trout remained within the original 30m stocking location; 45 percent of the trout moved downstream while 33 percent moved upstream. The median dispersion distance and direction for all trout that moved beyond the initial release sites was 30m downstream. The majority (75%) of the marked fish were caught within 400m of the stocking location. There was no significant difference (P>0.136) between the median distance moved of trout stocked into pools and those stocked into riffles. Three major

## STOCKING AND INTRODUCTIONS (CONTINUED)

82-001197 CONTINUED physical factors (residence time, water temperatures, and stream flow rates) were found to strongly influence stocked trout dispersion. The distance trout moved was directly correlated (R=0.50, p<0.001) with the amount of time in the stream. During stream conditions of low water temperatures and high flow rates, trout dispersion increased. Movement of spring stocked rainbow trout was primarily downstream, while movement of fall stocked trout was upstream. Summer stocked rainbow trout showed little movement.

82-001198 Krueger, C. C.; A. J. Gharrett; T. R. Dehring and F. W. Allendorf. GENETIC ASPECTS OF FISHERIES REHABILITATION PROGRAMS. *Can. J. Fish. Aquatic Sci.* 38(12):1877-1881. Dec. 1981. In English with French summ. SFA 27(2)
[Wis. Dep. Nat. Resour., 101 South Webster St., GEF II, Box 7921, Madison 53707]

82-001199 MacLean, J. A.; D. O. Evans; N. V. Martin and R. L. DesJardine. SURVIVAL, GROWTH, SPAWNING DISTRIBUTION, AND MOVEMENTS OF INTRODUCED AND NATIVE LAKE TROUT *(SALVELINUS NAMAYCUSH)* IN TWO INLAND ONTARIO LAKES. *Can. J. Fish. Aquatic Sci.* 38(12):1685-1700. Dec. 1981. In English with French summ. SFA 27(2)
[Ontario Minist. Nat. Resour., Box 50, Maple, ON L0J 1E0, Canada]

82-001200 Moore, D. E. ESTABLISHING AND MAINTAINING THE TROUT FISHERY AT RUTLAND WATER. *Hydrobiologia* 88(1-2):179-189. 26 Mar. 1982. SFA 27(2)
[Anglian Water Authority, North St., Oundle, Peterborough, England]

82-001201 Nielsen, L. A.; W. T. Kendall and L. A. Helfrich. COMPARISON OF ANGLER USE AND CHARACTERISTICS AT THREE CATCHABLE TROUT FISHERIES IN VIRGINIA. *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:330-340. 1980[1981]. SFA 27(2)
[Dep. Fish. Wildl. Sci., VPI&SU, Blacksburg, VA 24061] Creel census data for 3 catchable trout fisheries in Virginia revealed that desirable attributes of the fisheries increased from a lightly-stocked stream to a lightly-stocked lake to a heavily-stocked stream. Total effort, participation by non-local anglers, eveness of seasonal use, catch rate, and return rate all were higher for the heavily-stocked stream. For the trout lake, total effort and participation by non-local anglers were similar to the heavily-stocked stream, but catch per effort, return rates of stocked fish, and seasonal distribution of effort were similar to the lightly-stocked stream. Most anglers at the lake fished from shore so that a large portion of the potential fishing area was not utilized. Management of catchable trout fisheries may provide higher fishing value if streams are managed so that stocking density, stocking frequency, accessibility of angling, publicity, and opportunities for associated outdoor recreation are maximized.

82-001202 Reisenbichler, R. R.; J. D. McIntyre and R. J. Hallock. RELATION BETWEEN SIZE OF CHINOOK SALMON, *ONCORHYNCHUS TSHAWYTSCHA*, RELEASED AT HATCHERIES AND RETURNS TO HATCHERIES AND OCEAN FISHERIES. *Calif. Fish Game* 68(1):57-59. Jan. 1982. SFA 27(2)
[U.S. FWS, Bldg. 204, Naval Support Activity, Seattle, WA 98115]

82-001203 Webster, D. W. and W. A. Flick. PERFORMANCE OF INDIGENOUS, EXOTIC, AND HYBRID STRAINS OF BROOK TROUT (*SALVELINUS FONTINALIS*) IN WATERS OF THE ADIRONDACK MOUNTAINS, NEW YORK. *Can. J. Fish. Aquatic Sci.* 38(12):1701-1707. Dec. 1981. In English with French summ. SFA 27(2)
[Dep. Nat. Resour., Cornell Univ., Ithaca, NY 14853]

## FISHING GEAR AND TECHNIQUES

82-001204 Ferro, R. S. T. CHOOSING THE SIZE OF SUBERKRUB TRAWL BOARD TO SUIT A PELAGIC-TYPE FOUR-PANEL TRAWL. *Scott. Fish. Inf. Pam.* No. 6. 5p. 1981. SFA 27(2)
[Dep. Agric. Fish., Mar. Lab., Aberdeen, Scotland]

82-001205 Ferro, R. S. T. THE CALCULATION OF THE TWINE AREA OF A TRAWL NET. *Scott. Fish. Inf. Pam.* No. 5. 6p. 1981. SFA 27(2)
[Dep. Agric. Fish., Mar. Lab., Aberdeen, Scotland]

82-001206 Grimes, C. B.; K. W. Able and S. C. Turner. DIRECT OBSERVATION FROM A SUBMERSIBLE VESSEL OF COMMERCIAL LONGLINES FOR TILEFISH. *Trans. Am. Fish. Soc.* 111(1):94-98. Jan. 1982. SFA 27(2)
[Dep. Horticult. For., Rutgers Univ., New Brunswick, NJ 08903]

82-001207 Guillory, V.; J. E. Roussel and C. Miller. APPRAISAL OF OTTER TRAWL TOW LENGTHS AND REPLICATE SAMPLING. *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:158-166. 1980[1981]. SFA 27(2)
[La. Dep. Wildl. Fish., Mar. Res. Lab., Grand Isle 70358] This study was conducted to determine the effects of otter trawl tow length on variability and catch rates, and to assess replicate sampling. Longer tows caught more individuals/minute, individuals/tow, and species/tow than the shorter tows. The total number of species caught per hour of sampling, however, were esentially equal for all tow lengths. No difference in precision between tow lengths were detected. The number of replicates needed to detect changes within desirable statistical limits were logistically impractical. We recommend that otter trawls be used strictly for qualitative purposes and conclude that a small number of replicated 10-minute tows would adequately described basic community structure.

82-001208 Honda, K.; M. Suzuki and K. Matuda. [STRENGTH AGAINST REPEATED IMPACT LOAD ON NETTING TWINES.] *Bull. Jpn. Soc. Sci. Fish.* 47(11):1431-1435. Nov. 1981. In Japanese with English summ. SFA 27(2)
[Tokyo Univ. Fish., 5-7, Konan-4, Minato, Tokyo 108, Japan]

82-001209 International Council for the Exploration of the Sea. GUIDE TO EXPERIMENTAL PROCEDURE IN FISHING GEAR RESEARCH AND DEVELOPMENT. *Int. Counc. Explor. Sea Coop. Res. Rep.* No. 109. 38p. Aug. 1981. SFA 27(2)
[Palægade 2-4, 1261 Copenhagen K, Denmark]

82-001210 Miller, C. and V. Guillory. A COMPARISON OF MARSH FISH COMMUNITIES USING THE WEGENER RING. *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:223-233. 1980[1981]. SFA 27(2)
[La. Dep. Wildl. Fish., Mar. Res. Lab., Grand Isle 70358] Three marsh types (saline, brackish, and freshwater) in the Barataria Basin were sampled with the Wegener Ring. Forty-four species were collected, representing 21 families. Overall species composition and within species abundance varied from saline to freshwater environments. Shannon-Weaver diversity and evenness diversity show a decreasing gradient from saline to freshwater marsh. Number of individuals collected had an opposite gradient. The order of sequence from highest to lowest for biomass was fresh, saline, and then brackkish. The saline marsh had the highest species richness value, while freshwater marsh had a slightly higher value than the brackish marsh.

## FISHING GEAR AND TECHNIQUES (CONTINUED)

82-001211 Miura, T. [MULTIPLE CONSTRUCTION TRAP MODEL BEING AS AN EXAMPLE OF SET NETS AND OTHERS.] *Bull. Jpn. Soc. Sci. Fish.* 47(11):1401-1409. Nov. 1981. In Japanese with English summ. SFA 27(2)
[Fac. Fish., Hokkaido Univ., Hakodate 041, Japan]

82-001212 Schramm, H. L., Jr. and C. H. Pennington. DIEL FLUCTUATIONS OF LARVAL FISH IN THE LOWER MISSISSIPPI RIVER. *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:360-371. 1980[1981]. SFA 27(2)

[Sch. For. Resour. Conserv., Univ. Fla., Gainesville 32611] Larval fish were collected in the Lower Mississippi River at Sunnyside Revetment on 27-28 June 1978 to investigate diel fluctuations in diversity and abundance and to determine whether samples collected for 1-2 hours and from opposite sides of the boat can be considered replicate samples for a time period. Number of taxa and density differed significantly ($P<0.01$) between time periods of the diel cycle. Number of taxa and density were greatest at dusk. Twelve taxa were collected only in dusk, night, and dawn samples. *Aplodinotus grunniens*, *Carpiodes* spp. and clupeids accounted for 95 percent of the larvae collected. *A. grunniens* and *Carpiodes* spp. were more abundant in dusk and night samples. Clupeids were more abundant diurnally. Variance component analyses indicated that samples collected for 1-2 hours during each time period can be considered replicate samples for diversity and abundance estimates for that time period and samples collected from opposite sides of the boat can be considered replicate samples for divesity but not density estimates for each time period.

82-001213 Shimamura, T. and H. Soeda. [ON THE CATCH BY DEEP LAYER TUNA LONG LINE FISHING.] *Bull. Jpn. Soc. Sci. Fish.* 47(12):1559-1565. Dec. 1981. In Japanese with English summ. SFA 27(2)
[Coll. Agric. Vet. Med., Nihon Univ., 34-1, Shimouma, Setagaya, Tokyo 154, Japan]

## FERTILIZATION OF SOIL AND WATER

82-001214 Hansell, D. A. and C. E. Boyd. USES OF HYDRATED LIME IN FISH PONDS. *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:49-58. 1980[1981]. SFA 27(2)

[Dep. Fish. Allied Aquacult., Auburn Univ., Auburn, AL 36849] Hydrated lime is not as suitable as agricultural limestone for increasing pH and total alkalinity in soft water ponds. However, small amounts of hydrated lime may be applied during dry summer months to increase alkalinity for several weeks in ponds that have such high water exchange rates during wetter months that conventional applications of agricultural limestone are ineffective. Hydrated lime is an effective sterilant for damp pond bottoms. It will also remove carbon dioxide from water. Hydrated lime is not an oxidizing agent, so it will not destroy organic matter in mud or water. The biochemical oxygen demand (BOD) of water may be reduced by large applications of hydrated lime because the lime increases pH to levels toxic to microorganisms. The concentraton of hydrated lime necessary to reduce BOD will retard photosynthesis and will harm fish. Although hydrated lime can be used to raise pH and kill fish, its potential as a fish eradicant needs further study. Hydrated lime is not as effective as alum in coagulating clay turbidity. There is no evidence that hydrated lime will reduce problems with off-flavor in fish.

82-001215 McGeachin, R. B. and R. R. Stickney. MANURING RATES FOR PRODUCTION OF BLUE TILAPIA IN SIMULATED SEWAGE LAGOONS RECEIVING LAYING HEN WASTE. *Prog. Fish-Cult.* 44(1):25-28. Jan. 1982. SFA 27(2)
[Dep. Wildl. Fish. Sci., Tex. A&M Univ., College Station 77842]

## FERTILIZATION OF SOIL AND WATER (CONTINUED)

82-001216 Melack, J. M.; P. Kilham and T. R. Fisher. RESPONSES OF PHYTOPLANKTON TO EXPERIMENTAL FERTILIZATION WITH AMMONIUM AND PHOSPHATE IN AN AFRICAN SODA LAKE. *Oecologia (Berl.)* 52(3):321-326. Mar. 1982. SFA 27(2)
[Dep. Biol. Sci., Univ. Calif., Santa Barbara 93106]

## FISHWAYS, FISH PASSAGE THROUGH DAMS, ETC.

82-001217 Jensen, A. L. and T. A. Hamilton. APPLICATION OF A CONVENTIONAL FISHERY MODEL FOR ASSESSMENT OF ENTRAINMENT AND IMPINGEMENT IMPACT. *Environ. Biol. Fishes* 7(2):181-185. 15 Mar. 1982. SFA 27(2)
[Sch. Nat. Resour., Univ. Mich., Ann Arbor 48109] A conventional stock assessment model is applied to determine the impact of entrainment and impingement at the Monroe Power Plant on the yellow perch stock of the Western basin of Lake Erie. Parameters of the model are estimated using power plant data, biological data available in the literature, and commercial catch data. The model is applied to estimate the age structure and biomass of the perch stock and to estimate the impact of the power plant on abundance of the impingeable stock and abundance and biomass of the exploited stock. The level of impact was examined under a range of mortality conditions. Under the most extreme conditons examined of full pumping, high fishing mortality, and low natural mortality, the fishable biomass is reduced by 1.7%. This impact is not large, but there are several other power plants and many additional water intakes around the Western basin of Lake Erie.

82-001218 Jensen, A. L.; S. A. Spigarelli and M. M. Thommes. USE OF CONVENTIONAL FISHERY MODELS TO ASSESS ENTRAINMENT AND IMPINGEMENT OF THREE LAKE MICHIGAN FISH SPECIES. *Trans. Am. Fish. Soc.* 111(1):21-34. Jan. 1982. SFA 27(2)
[Sch. Nat. Resour., Univ. Mich., Ann Arbor 48109]

82-001219 Sano, N.; T. Mikami; Y. Akiba and G. Anma. [ON THE TRIAL PRODUCTION AND USE OF FISH COUNTING SYSTEM OF SALMON ENTERING THE MOHEJI RIVER.] *Bull. Fac. Fish. Hokkaido Univ.* 32(4):388-399. Nov. 1981. In Japanese with English summ. SFA 27(2)
[Lab. Instru. Eng. Fish., Fac. Fish., Hokkaido Univ., Hakodate, Japan]

82-001220 Ulanowicz, R. E.; J. M. Lindsay; W. C. Caplins and T. T. Polgar. SIMULATING THE LATERAL TRANSPORT OF ICHTHYOPLANKTON IN THE POTOMAC ESTUARY. *Estuaries* 5(1):57-67. Mar. 1982. SFA 27(2)
[Univ. Md., Cent. Environ. Estuarine Stud., Chesapeake Biol. Lab., Solomons, MD 20688] Previous simulations of potential ichthyoplankton entrainment by power generating stations of the Potomac estuary have not included the influence of lateral transport in distributing eggs and larvae over the nursery area. Therefore, two-dimensional, vertically-averaged hydrodynamic and kinematic models of passive organism transport were developed to represent advective and dispersive processes near the proposed Douglas Point Nuclear Generating Station. Although the more refined model did not substantially alter the estimate of ichthyoplankton entrainment, it did reveal that lateral inhomogeneities in hydrodynamics could engender severalfold differences in entrainment probabilities on opposite sides of the estuary. Models of higher resolution and greater biological detail did not project greater total entrainment by the Douglas Point plant, because the volume of nontidal flow past the site was large in comparison to the proposed rate of cooling water withdrawal.

## MATHEMATICS, STATISTICAL METHODS, AND MODELING

82-001221 Briggs, H.; R. Townsend and J. Wilson. AN INPUT-OUTPUT ANALYSIS OF MAINE'S FISHERIES. *Mar. Fish. Rev.* 44(1):1-7. Jan. 1982. SFA 27(2)
[Dep. Econ., Univ. Me., Orono 04469]

82-001222 Gardner, P. N. USE OF CYCLE DUMMY VARIABLES AND RACE ESCAPEMENT IN THE FRASER RIVER SOCKEYE SALMON (*ONCORHYNCHUS NERKA*) RECRUITMENT FUNCTION. *Can. J. Fish. Aquatic Sci.* 39(2):264-269. Feb. 1982. In English with French summ. SFA 27(2)
[Dep. Econ., Univ. Prince Edward Island, 550 University Ave., Charlottetown, P.E.I. C1A 4P3, Canada]

82-001223 Giguère, L. A.; A. Delâge; L. M. Dill and J. Gerritsen. PREDICTING ENCOUNTER RATES FOR ZOOPLANKTON: A MODEL ASSUMING A CYLINDRICAL ENCOUNTER FIELD. *Can. J. Fish. Aquatic Sci.* 39(2):237-242. Feb. 1982. In English with French summ. SFA 27(2)
[Dep. Biol. Sci., Simon Fraser Univ., Burnaby, BC V5A 1S6, Canada]

82-001224 Kitabatake, Y. A DYNAMIC PREDATOR-PREY MODEL FOR FISHERY RESOURCES: A CASE OF LAKE KASUMIGAURA. *Environ. Plan.* A 14(2):225-235. Feb. 1982. SFA 27(2)
[Natl. Inst. Environ. Stud., Yatabe-machi, Tsukuba, Ibaraki 305, Japan] A dynamic model for fishery resources with predator-prey relationships is constructed based on observational data and research findings for Lake Kasumigaura, Japan. The analysis of the stationary state as well as the sensitivity analysis shows that the use of diesel-powered trawling, which enables the large-scale catch of prey species in comparison with the traditional method of sailing trawling, may lead to the extinction of predator as well as prey species once the trawling efficiency in the catch of prey species is improved beyond the present level, provided that fishermen behave so as to maximize their profits subject to the restriction of operation time.

82-001225 Muller, M.; J. W. M. Osse and J. H. G. Verhagen. A QUANTITATIVE HYDRODYNAMICAL MODEL OF SUCTION FEEDING IN FISH. *J. Theor. Biol.* 95(1):49-79. 7 Mar. 1982. SFA 27(2)
[Dep. Exp. Anim. Morphol. Cell Biol., Agric. Univ., Zodiac Marjkeweg 40, 6709 PG Wageningen, Netherlands]

82-001226 Reed, R. B. and W. D. Davies. ESTIMATING RATE OF EXPLOITATION FROM TAG RETURNS AND FISHING EFFORT. *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:151-157. 1980[1981]. SFA 27(2)
[Dep. Fish. Allied Aquacult., Agric. Exp. Stn., Auburn Univ., Auburn, AL 36849] A method was developed for estimating rate of exploitation from the rate of decline in catch per unit effort of tagged fish. The method was used to estimate exploitation of largemouth bass (*Micropterus salmoides*) at a 75-ha Chambers County Public Fishing Lake, Alabama. Fishing effort directed towards largemouth bass was estimated from an access creel survey employing nonuniform probability sampling. The estimated 58 percent rate of exploitation agreed well with an independent estimate made using catch records and an estimate of the number of harvestable-size (>249mm total length) bass in the population.

## MATHEMATICS, STATISTICAL METHODS, AND MODELING (CONTINUED)

82-001227 Sims, S. E. ALGORITHMS FOR SOLVING THE CATCH EQUATION FORWARD AND BACKWARD IN TIME. *Can. J. Fish. Aquatic Sci.* 39(1):197-202. Jan. 1982. In English with French summ. SFA 27(2)
[Dep. Math. Stat., La. Tech Univ., Ruston 71272]

## LAKE MANAGEMENT AND RESEARCH

82-001228 Bagenal, T. B. EXPERIMENTAL MANIPULATIONS OF THE FISH POPULATIONS IN WINDERMERE. *Hydrobiologia* 86(1-2):201-205. 16 Jan. 1982. SFA 27(2)
[Freshwater Biol. Assoc., Windermere Lab., Ambleside, Cumbria, England] A large scale experiment has been carried out on the perch and pike populations of Windermere in the English Lake District for nearly 40 years, and the objectives have changed over this period. Initially the aim was to manage the trout population, but the work has produced data of interest in predator-prey relationships and pike management. Perch was first heavily fished and then monitored for size, and numbers by trapping. Large pike have been culled by gill netting. The effects of pike gill netting have been to increase the growth rate and decrease the average age in the population. These changes in the pike population structure, together with climatic variations, have modified the perch population. The perch did not recover from the heavy fishing for many years and the population numbers remained low due to pike predation supressing recruitment. It was not until a large cohort, mainly controlled by the weather, was produced that the population increased. Cannibalism by these perch later combined with the pike predation to suppress future cohorts. There have also been as yet unexplained changes in the perch mortality rates. The experiments have led to a greater understanding of the relationship between pike and perch populations, but the use of this knowledge for management depends on what the objectives are.

82-001229 Borgeson, D. P. CHANGING MANAGEMENT OF GREAT LAKES FISH STOCKS. *Can. J. Fish. Aquatic Sci.* 38(12):1466-1468. Dec. 1981. SFA 27(2)
[Fish. Div., Mich. Dep. Nat. Resour., Lansing 48909]

82-001230 Brown, E. H., Jr.; G. W. Eck; N. R. Foster; R. M. Horrall and C. E. Coberly. HISTORICAL EVIDENCE FOR DISCRETE STOCKS OF LAKE TROUT (*SALVELINUS NAMAYCUSH*) IN LAKE MICHIGAN. *Can. J. Fish. Aquatic Sci.* 38(12):1747-1758. Dec. 1981. In English with French summ. SFA 27(2)
[U.S. FWS, Great Lakes Fish. Lab., Ann Arbor, MI 48105]

82-001231 Fetterolf, C. M., Jr. FORWORD TO THE STOCK CONCEPT SYMPOSIUM. *Can. J. Fish. Aquatic Sci.* 38(12):iv-v. Dec. 1981. SFA 27(2)
[Great Lakes Fish. Comm., 1451 Green Rd., Ann Arbor, MI 48105]

82-001232 Goodier, J. L. NATIVE LAKE TROUT (*SALVELINUS NAMAYCUSH*) STOCKS IN THE CANADIAN WATERS OF LAKE SUPERIOR PRIOR TO 1955. *Can. J. Fish. Aquatic Sci.* 38(12):1724-1737. Dec. 1981. In English with French summ. SFA 27(2)
[Inst. Environ. Stud., Univ. Toronto, Toronto, ON M5S 1A4, Canada]

82-001233 Hickman, T. J. and R. Williams. DISCOVERY AND MANAGEMENT OF THE ORIGINAL PYRAMID LAKE CUTTHROAT TROUT. *Proc. Desert Fishes Counc.* 12:90-91. 1980(1981). In English and Spanish. SFA 27(2)

## LAKE MANAGEMENT AND RESEARCH (CONTINUED)

82-001233 CONTINUED
[U.S. FWS, Fort Collins, CO] In 1977, a pure population of the original strain of Pyramid Lake cutthroat trout, *Salmo clarki henshawi* (a federally threatened species), was discovered by the senior author in a small unnamed stream on the Pilot Peak range, Utah-Nevada. The Pyramid Lake cutthroat trout was the largest trout native to Western North America. The original strain of Pyramid Lake cutthroat trout was presumed extinct after the 1940's. During the spring of 1980, 200 eggs were collected and transported from this unnamed stream to a federal fish hatchery, but no fish hatched successfully. Also during the spring of 1980, 18 trout were transplanted to a nearby creek, Bettridge Creek. Thus far the transplant is believed to have a been success. Future management plans involve developing a broodstock of this Pyramid Lake strain and establishing new populations within its native range. Developing a broodstock will be difficult because of the low numbers of trout in this population. It is hopeful that the introduced population in Bettridge Creek will provide additional fish to work with.

82-001234 Jones, J. R. and M. V. Hoyer. SPORTFISH HARVEST PREDICTED BY SUMMER CHLOROPHYLL-*α* CONCENTRATION IN MIDWESTERN LAKES AND RESERVOIRS. *Trans. Am. Fish. Soc.* 111(2):176-179. Mar. 1982. SFA 27(2)
[Sch. For. Fish. Wildl., Univ. Mo., Columbia 65211]

82-001235 Kautz, R. S. EFFECTS OF EUTHROPHICATION ON THE FISH COMMUNITIES OF FLORIDA LAKES. *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:67-80. 1980[1981]. SFA 27(2)
[Off. Environ. Serv., Fla. Game Fresh Water Fish Comm., Tallahassee 32301] From an analysis of the trophic status and fish populations of 22 Florida lakes, total fish biomass is low in oligotrophic lakes, increases to a maximum in mesotrophic-eutrophic lakes, and fluctuates around the maximum value in hypereutrophic lakes. Total fish density likewise is low in oligotrophic lakes and increases to a maximum in mesotrophic-eutrophic lakes; but unlike biomass, fish density declines as lakes become hypereutrophic and gizzard shad becomes the dominant species of fish. Sport fishes reach maximum biomass and optimum densities in mesotrophic-eutrophic lakes with a total nitrogen concentration of 1.2mg/l and a chlorophyll *a* concentration of 11.0ug/l, but suffer adverse effects with further enrichment.

82-001236 Kutkuhn, J. H. STOCK DEFINITION AS A NECESSARY BASIS FOR COOPERATIVE MANAGEMENT OF GREAT LAKES FISH RESOURCES. *Can. J. Fish. Aquatic Sci.* 38(12):1476-1478. Dec. 1981. SFA 27(2)
[U.S. FWS, Great Lakes Fish. Lab., Ann Arbor, MI 48105]

82-001237 Oglesby, R. T. THE MEI SYMPOSIUM--OVERVIEW AND OBSERVATIONS. *Trans. Am. Fish. Soc.* 111(2):171-175. Mar. 1982. SFA 27(2)
[Dep. Nat. Resour., Cornell Univ., Ithaca, NY 14853-0188]

82-001238 Pihu, E. and A. Mäemets. THE MANAGEMENT OF FISHERIES IN LAKE VÕRTSJÄRV. *Hydrobiologia* 86(1-2):207-210. 16 Jan. 1982. SFA 27(2)
[Inst. Zool. Bot., Acad Sci. Estonia S.S.R., Tallinn, USSR] L. Võrtsjärv is a eutrophic lake in Central Estonia. The area of the lake is $270km^2$, the average depth only 2.8m. The biological productivity of the lake is rather low. Twelve to fifteen years ago the main fish were ruff and perch (80-90% of catch), while the numbers of valuable fish were small. At the same time the total catch of fish was relatively high--about 300 tons a year. Attempts were made to reduce the numbers of undesirable fish by by intense trawl-catch but no marked results were achieved. Subsequently trawl-catch was ended, elvers were regularly introduced into the lake and

## LAKE MANAGEMENT AND RESEARCH (CONTINUED)

82-001238 **CONTINUED** protection of valuable fish was improved. At the present time the total catch of fish has decreased (184 tons in 1979), but pike-perch and eels are now the main game fish (50-60% of catch) and the value of the catch of fish has risen 2-3 times.

82-001239 Ryder, R. A. **THE MORPHOEDAPHIC INDEX--USE, ABUSE, AND FUNDAMENTAL CONCEPTS.** *Trans. Am. Fish. Soc.* 111(2):165-170. Mar. 1982. SFA 27(2)
[Mar. Ecol. Lab., Bedford Inst. Oceanogr., P.O. Box 1006, Dartmouth, NS B27 4A2, Canada]

82-001240 Salojärvi, K.; E. Auvinen and E. Ikonen. **A PLAN FOR FISHERIES MANAGEMENT IN THE LAKES DRAINED BY THE OULUJOKI RIVER.** *Hydrobiologia* 86(1-2):211-217. 16 Jan. 1982. SFA 27(2)
[Finnish Game Fish Res. Inst., Fish. Div., P.O. Box 193, SF-00131 Helsinki 13, Finland] Freshwater fishery management is treated as a dynamic system comprising environment protection and improvement, fishing, fishery resources allocation, fish stocking programs and marketing policy. The aims of the plan are to increase the economic value of the catch and to protect the professional fishery. Fisheries statistics, catch per unit effort data and other material were collected during 1972-1976. The total allowable catch (TAC) for the most important fish species was estimated with MSY and population analysis models. The results of fish stocking were studied by tagging and population analysis calculations. Fishing of vendace and non-valuable species (perch, roach, smelt) can be increased, but the fishing pressure on other species should not be raised above the present level. Restrictions on whitefish fishing are needed in some areas. A balanced multispecies fishery is desirable, and suggestions are given for the composition of the fishing gear. Fish stocking can make possible a larger and more valuable catch, but at present its profitability is rather low. The stocking results are strongly affected by the fishery and the gear composition.

82-001241 Schlesinger, D. A. and H. A. Regier. **CLIMATIC AND MORPHOEDAPHIC INDICES OF FISH YIELDS FROM NATURAL LAKES.** *Trans. Am. Fish. Soc.* 111(2):141-150. Mar. 1982. SFA 27(2)
[Inst. Environ. Stud., Univ. Toronto, Toronto, ON M5S 1A1, Canada]

82-001242 Toivonen, J.; H. Auvinen and P. Valkeajärvi. **FISH STOCK ASSESSMENTS IN LAKE KONNEVESI.** *Hydrobiologia* 86(1-2):219-222. 16 Jan. 1982. SFA 27(2)
[Finnish Game Fish. Res. Inst., Fish. Div., P.O. Box 193, SF-00131 Helsinki 13, Finland] In 1977, the average fish yield in the oligotrohic and oligohumic lake Konnevesi was 6.4kg $ha^{-1}$ (2.6 kg vendace, 1.3kg perch, 0.7kg whitefish, 0.5kg roach, 0.3kg pike and 0.3kg burbot). In that year the stock of vendace was exceptionally poor. A study was made to determine the optimum strategy for exploiting the stocks. The field work included test fishing (1970-78), sampling of catches (1977-80) and collection of catch per unit effort data (1978-80), and catch statistics (1969, 1970, 1977). The stocks were assessed by the Beverton and Holt method. Whitefish is exploited at a proper level. Fishing of vendace and roach can be increased, and the yield of pike would be greater, if the recruiting age were higher than at present.

82-001243 Youngs, W. D. and D. G. Heimbuch. **ANOTHER CONSIDERATION OF THE MORPHOEDAPHIC INDEX.** *Trans. Am. Fish. Soc.* 111(2):151-153. Mar. 1982. SFA 27(2)
[Dep. Nat. Resour., Cornell Univ., Ithaca, NY 14853]

## RIVER AND STREAM MANAGEMENT AND RESEARCH

82-001244 Evans, W. A. CAN WE SAVE OUR ANADROMOUS FISH RESOURCES IN SMALL COASTAL STREAMS?--A LOOK AT THE PAST, PRESENT AND FUTURE. *Cal-Neva Wildl. Trans.* p. 148-154. 1981. SFA 27(2)
[U.S. For. Serv., Region 5, San Francisco, CA 94111] The status of anadromous fish resources in small coastal rivers is examined for the periods of 1900-1940, 1940-1980, and 1980-2020 in the Southern, Central and Northern areas of California. Declining trends are perceived in all areas ranging from annihilation in the Southern and San Francisco Bay areas to partial retention in the Northern sector. Principal causes for the decline are briefly covered along with proposed solutions to the present dilemma.

82-001245 Gerstung, E. R. STATUS AND MANAGEMENT OF THE COAST CUTTHROAT TROUT (*SALMO CLARKI CLARKI*) IN CALIFORNIA. *Cal-Neva Wildl. Trans.* p. 25-32. 1981. SFA 27(2)
[Calif. Dep. Fish. Game, Sacramento] Coast cutthroat trout, *Salmo clarki clarki*, are restricted in California to a narrow coastal strip 5 to 20 miles wide extending north from the Eel River Delta. Limited information regarding occurrence and relative abundance has been obtained as a by-product of anadromous fish sampling and habitat surveys. Estimates of sea run escapement, harvests, and angling use do not exist in California. Coast cutthroat trout appear to be declining in abundance as a result of widespread habitat degradation. Coast cutthroat trout in California have been observed in 780 miles of stream and 4 coastal lagoons. The best populations occur in the Smith River system. Sea run populations occur in larger waterways north of the Mad River. Little management effort outside of habitat protection and some limited stocking of hatchery reared fish has been directed toward coast cutthroat trout in this state.

82-001246 Hoyt, R. D. and W. A. Robison. EFFECTS OF IMPOUNDMENT ON THE FISHES IN TWO KENTUCKY TAILWATERS. *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:307-317. 1980[1981]. SFA 27(2)
[Dep. Biol., West. Ky. Univ., Bowling Green 42101] The most noticeable differences in the pre- and post-impoundment tailwater fish communities in Green and Barren rivers, Kentucky, were reduced biomass, loss of cyprinid species, increased game-fish numbers, and decreased rough-fish numbers. These differences were attributed to altered post-impoundment environmental conditions in the tailwater (lowered water temperatures and irregular flow patterns), and species recruitment through the dams. Carp, while not present before impoundment in the tailwater reaches, represented a prominent component of the community after damming.

82-001247 Lee, D. P. INSTREAM FLOW REQUIREMENTS FOR DINKEY CREEK, FRESNO COUNTY. *Cal-Neva Wildl. Trans.* p. 1-10. 1981. SFA 27(2)
[Calif. Dep. Fish Game, 1234 E. Shaw Ave., Fresno 93710]

82-001248 McDonald, J. THE STOCK CONCEPT AND ITS APPLICATION TO BRITISH COLUMBIA SALMON FISHERIES. *Can. J. Fish. Aquatic Sci.* 38(12):1657-1664. Dec. 1981. In English with French summ. SFA 27(2)
[Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada]

82-001249 Minckley, W. L. TROPHIC INTERRELATIONS AMONG INTRODUCED FISHES IN THE LOWER COLORADO RIVER, SOUTHWESTERN UNITED STATES. *Calif. Fish Game* 68(2):78-89. Apr. 1982. SFA 27(2)
[Dep. Zool., Ariz. State Univ., Tempe 85281] Analysis of 1,050 stomachs of 18 species of fishes from the lower Colorado River mainstream indicates a relatively simplified food web based on autochthonous detrital materials,

## RIVER AND STREAM MANAGEMENT AND RESEARCH (CONTINUED)

82-001249 CONTINUED algae, and macrophytes. Aquatic insects, clams, and crayfish eaten by larger fishes fed directly on detritus or particles filtered from the water. Threadfin shad and red shiner, both depending principally on detritus as food, were major forage for piscivores.

82-001250 Norris, R. M., Jr. HISTORY & ROLE OF THE POTOMAC RIVER FISHERIES COMMISSION. *Proc. Annu. Meet. Potomac Chap. Am. Fish. Soc.* 5:159-165. 1981(1982). SFA 27(2)

82-001251 Rasin, V. J., Jr. and P. J. Leach. WATER QUALITY AND RECREATIONAL OPPORTUNITIES ALONG THE POTOMAC RIVER IN THE VICINITY OF THE DISTRICT OF COLUMBIA. *Proc. Annu. Meet. Potomac Chap. Am. Fish. Soc.* 5:90-96. 1981(1982). SFA 27(2)
[4205 Warner St., Kinsington, MD 20895]

82-001252 Ricker, W. E. CHANGES IN THE AVERAGE SIZE AND AVERAGE AGE OF PACIFIC SALMON. *Can. J. Fish. Aquatic Sci.* 38(12);1636-1656. Dec. 1981. In English with French summ. SFA 27(2)
[Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada]

82-001253 Saunders, R. L. ATLANTIC SALMON (*SALMO SALAR*) STOCKS AND MANAGEMENT IMPLICATIONS IN THE CANADIAN ATLANTIC PROVINCES AND NEW ENGLAND, USA. *Can. J. Fish. Aquatic Sci.* 38(12):1612-1625. Dec. 1981. In English with French summ. SFA 27(2)
[Dep. Fish. Oceans, Biol. Stn., St. Andrews, NB E0G 2X0, Canada]

## FARM POND AND SMALL IMPOUNDMENT MANAGEMENT AND RESEARCH

82-001254 Farquhar, B. W.; R. L. Noble and C. E. Cichra. FACTORS AFFECTING FISH POPULATIONS IN FLOOD PREVENTION LAKES OF NORTH-CENTRAL TEXAS. *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:292-306. 1980[1981]. SFA 27(2)
[Dep. Wildl. Fish. Sci., Tex. A&M Univ., College Station 77843] During summer, 1976, limnological and fish population data were obtained from 56 flood prevention lakes of the Trinity River watershed. Fish samples obtained by gillnetting, electrofishing, and seining indicated that the principal fishes were largemouth bass (*Micropterus salmoides*), bluegill (*Lepomis macrochirus*), black bullheads (*Ictalurus melas*), white crappie (*Pomoxis annularis*), green sunfish (*Lepomis cyanellus*), channel catfish (*Ictalarus punctatus*), golden shiner (*Notemigonus crysoleucas*), and redear sunfish (*Lepomis microlophus*). Analysis of fish data was performed by simple and multiple correlation techniques in relation to physical, limnological, and biological variables. Variation in fish biomass, as indicated by gill net catch, was explained by a combination of biological and physical characteristics, whereas species composition was a more important factor in largemouth bass models. Channel catfish characteristics, in contrast, were highly affected by physical and limnological variables. Although models explaining variation in white crappie characteristics were generally imprecise, sunfish models were typically highly significant due to strong influence of physical and limnological factors. These results emphasize the need for management objectives directed toward a single species or group of species in flood prevention lakes.

## FARM POND AND SMALL IMPOUNDMENT MANAGEMENT AND RESEARCH (CONTINUED)

82-001255 Hallerman, E. M.; D. P. Philipp and M. Pasdar. USE OF HYBRID SUNFISH IN PONDS OR SMALL IMPOUNDMENTS. *Cal-Neva Wildl. Trans.* p. 33-37. 1981. SFA 27(2)
[Coachella Valley Water Dist., P.O. Box 1058, Coachella, CA 92236] Growth of hybrids of redear and green sunfish, in their first two growing seasons, compared favorably with that of the parental species raised in the same ponds. The redear ♀ X green ♂ hybrid showed somewhat greater weight gain than its reciprocal hybrid, in at least the first year. This accelerated growth suggests the utility of establishing populations of these particular hybrids in situations where they are isolated from the parent species. Work is underway to estimate the likelihood of backcrossing in mixed hybrid and nonhybrid communities.

## LARGE IMPOUNDMENT MANAGEMENT AND RESEARCH

82-001256 Combs, D. L. FISH POPULATION CHANGES IN KEYSTONE RESERVOIR FOURTEEN YEARS AFTER STRIPED BASS INTRODUCTIONS. *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:167-174. 1980[1981]. SFA 27(2)
[Okla. Dep. Wildl. Conserv., Porter 74454] During the 14 years after initial introduction, a viable striped bass (*Morone saxatilis*) sport fishery development on Keystone Reservoir. Natural reproduction, first identified in 1970, continued through 1979 in tributary rivers. Selected endemic fish species showed no significant changes in standing crop estimates from cove rotenone studies 1971-73, 1976-79. Available prey-predator ratios (AP/P) showed a fluctuating availability of forage for small predators and ample prey for large predators.

82-001257 Hudson, P. L. and W. E. Lorenzen. MANIPULATION OF RESERVOIR DISCHARGE TO ENHANCE TAILWATER FISHERIES. *Symp. Proc. Unified River Management (Am. Water Resour. Assoc.)* p. 568-579. 1980. SFA 27(2)
[U.S. FWS, Southeast Reservoir Invest., 206 Highway 123 By-Pass, Clemson, SC 29631] Depths at which water is withdrawn from reservoirs, and associated water release patterns, are among the most important determinants of reservoir river biology. Although past concerns have been for the fishery in either the upstream reservoir or downstream tailwater, contemporary systems management requires a unified approach encompassing the entire river basin. Losses of fish, plankton, insects, and nutrients through reservoir discharges are usually thought of as a reservoir loss rather than as a tailwater or downstream gain. Research by the U.S. Fish and Wildlife Service has indicated that the distribution and movement patterns of many organisms in reservoirs are predictable. The predictability of the distribution of organisms near any water intake structure is a valuable management tool because it can be used to either reduce entrainment or facilitate the transport of organisms from reservoir to tailwater. Manipulation of water flow by multilevel intakes may not be feasible in a given year on all reservoirs in a basin but may be possible over a period of years.

82-001258 Jenkins, R. M. THE MORPHOEDAPHIC INDEX AND RESERVOIR FISH PRODUCTION. *Trans. Am. Fish. Soc.* 111(2):133-140. Mar. 1982. SFA 27(2)
[U.S. FWS, Natl. Reservoir Res. Proj., 100 W. Rock St., Fayetteville, AR 72701]

82-001259 Kohler, C. C. and J. J. Nagy. SUITABILITY OF ALEWIFE AS A PELAGIC FORAGE FISH FOR SOUTHEASTERN RESERVOIRS. *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:137-150. 1980[1981]. SFA 27(2)
[Fish. Res. Lab., South Ill. Univ., Carbondale 62901] Alewife (*Alosa pseudoharengus*) were evaluated as a pelagic forage fish for southeastern reservoirs based on results of trophic and population ecology studies

## LARGE IMPOUNDMENT MANAGEMENT AND RESEARCH (CONTINUED)

82-001259 CONTINUED conducted in Claytor Lake, Virginia. Positive attributes of the alewife forage based included: a) establishment of a profilic and self-sustaining population, b) high desirability and availability to pelagic predators, and c) a positive impact on growth of pelagic sportfish. Negative attributes included: a) predation on larval fish, b) low desirability and/or availability to littoral sportfishes, c) rapid growth beyond a size vulnerable to most predators, d) fluctuating population levels, e) alteration of zooplankton size composition by selective predation on largest forms, and f) emigration to a downstream reservoir. Alewife are most suitable for introduction to waters managed primarily for pelagic piscivores on a put-grow-take basis. Because of the potential for emigration, management decisions regarding alewife should be developed on a regional rather than local basis.

82-001260 Wright, G. L. and G. W. Wigtil. COMPARISON OF GROWTH, SURVIVAL, AND CATCHABILITY OF FLORIDA, NORTHERN, AND HYBRID LARGEMOUTH BASS IN A NEW OKLAHOMA RESERVOIR. *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:31-38. 1980[1981]. SFA 27(2)
[Okla. Dep. Wildl. Conserv., Rt. 3, Box 45, Holdenville 74848] Florida largemouth bass, *Micropterus salmoides floridanus*, northern largemouth bass, *M. s. salmoides*, and their $F^1$ hybrid were stocked in a new 420 ha reservoir, and their growth, relative survival and relative catchability were compared. The Florida and hybrid bass were found to achieve the best overall growth by the end of the study period. However, of the 3 strains, Florida bass appeared to have the greatest potential for growth. Hybrid bass suffered less relative mortality than Florida bass, which suffered less than northern bass. Differences in relative catchability were not observed among the three strains of bass.

## ESTUARY MANAGEMENT AND RESEARCH

82-001261 Barry, J. P. and G. M. Cailliet. THE UTILIZATION OF SHALLOW MARSH HABITATS BY COMMERCIALLY IMPORTANT FISHES IN ELKHORN SLOUGH, CALIFORNIA. *Cal-Neva Wildl. Trans.* p. 38-47. 1981. SFA 27(2)
[Moss Landing Mar. Lab., Moss Landing, CA 95039]

82-001262 Kapetsky, J. M. SOME CONSIDERATIONS FOR THE MANAGEMENT OF COASTAL LAGOON AND ESTUARINE FISHERIES. *FAO Fish. Tech. Pap.* No. 218. vii + 47p. 1981. SFA 27(2)
[Fish. Resour. Environ. Div., FAO of the UN, Rome, Italy]

82-001263 Richkus, W. A. and J. K. Summers. HISTORICAL ANALYSIS OF THE POTOMAC ESTUARY WHITE PERCH FISHERY. *Proc. Annu. Meet. Potomac Chap. Am. Fish. Soc.* 5:97-114. 1981(1982). SFA 27(2)
[Environ. Cent., Martin Marietta Corp., 1450 South Rolling Rd., Baltimore, MD 21227] White perch are one of the major sport and commerical species landed in the Potomac estuary. Average annual commercial landings between 1964 and 1971 were on the order of 200,000 lbs. The fishery shifts from mid-estuary in the spring to lower estuary in the summer and fall. Differing jurisdiction over tributaries and main stem complicates analysis of the fishery. Annual production of juveniles appears related to magnitude of landings in the main stem. Growth rates may be lower than in comparable water bodies. Regression analysis using a juvenile index as a predictor suggests that the main stem catch may consist primarily of 8 to 10 year old perch, possibly due to gill net selectivity. A surplus production model suggested that annual maximum equilibrium yield is 175,000 lbs.; however, model assumptions do not appear to be rigorously met.

## ESTUARY MANAGEMENT AND RESEARCH (CONTINUED)

82-001264 Unesco. COASTAL LAGOON RESEARCH, PRESENT AND FUTURE. *Unesco Tech. Pap. Mar. Sci.* 33. 348p. 1981. SFA 27(2)

[7, place de Fontenay, 75700 Paris, France]

## MARINE MANAGEMENT AND RESEARCH

82-001265 DeVries, D. A. DESCRIPTION AND CATCH COMPOSITION OF NORTH CAROLINA'S LONG HAUL SEINE FISHERY. *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:234-247. 1980[1981]. SFA 27(2)

[N.C. Dep. Nat. Resour. Community Dev., Div. Mar. Fish., Morehead City 28557]

82-001266 FAO of the UN. REPORT OF THE SIXTH SESSION OF THE FISHERY COMMITTEE FOR THE EASTERN CENTRAL ATLANTIC (CECAF). *FAO Fish. Rep.* No. 229. iii + 67p. 1980. SFA 27(2)

[Rome, Italy]

82-001267 International Council for the Exploration of the Sea. REPORTS ON DIALOGUE MEETINGS, 20-21 MAY AND 4 OCTOBER 1980. *Int. Counc. Explor. Sea Coop. Res. Rep.* No. 106. 69p. Apr. 1981. SFA 27(2)

[Palægade 2-4, 1261 Copenhagen K, Denmark]

82-001268 Pacific Fishery Management Council. PACIFIC COAST GROUNDFISH FISHERY MANAGEMENT PLAN. *Pac. Fish. Manage. Counc., Portland, Oreg.* 21 Jan. 1982. SFA 27(2)

[526 S.W. Mill St., Portland, OR 97201]

82-001269 Rivas, L. R. and D. B. McClellan. SHARK INVESTIGATIONS BY THE NATIONAL MARINE FISHERIES SERVICE, MIAMI LABORATORY. *Fla. Sci.* 45(1):40-45. 1982. SFA 27(2)

[NMFS, 75 Virginia Beach Dr., Miami, FL 33149]

82-001270 Stevenson, D. K. and F. Carranza. MAXIMUM YIELD ESTIMATES FOR THE PACIFIC THREAD HERRING, *OPISTHONEMA* SPP., FISHERY IN COSTA RICA. *NOAA Fish. Bull.* 79(4):689-703. Oct. 1981. SFA 27(2)

[Dep. Zool., Univ. Me., Orono 04469]

82-001271 Yamaguchi, Y. and K. Murabayashi. [THE FISH-LURING EFFECT OF FLOTSAM.] *Bull. Jpn. Soc. Sci. Fish.* 47(10):1295-1298. Oct. 1981. In Japanese with English summ. SFA 27(2)

[Fac. Fish., Mie Univ., Edobashi, Tsu 154, Japan] A research was made into the fish-luring effect of flotsam using the fishing records of the purseseine boat operating on the sea near New Guinea. The results obtained may be summarized as follows: 1) T-test shows that a moderately-aged flotsam with fouling animals has the best luring effect, a rotted one comes next, and a fresh one has the worst luring effect. 2) The fish-luring effect of flotsam drifting alone is better than that of assembled flotsam in current-boundary. 3) Flotsam with small bait fish or sea birds has a better luring effect than one without them. 4) It is estimated that a moderately-aged flotsam with fouling animals will lure 0.5~18.3 tons of fish per day.

## MISC. TECHNIQUES AND EQUIPMENT

82-001272 Boyd, C. E. COMPARISONS OF WATER ANALYSIS KITS. *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:39-48. 1980[1981]. SFA 27(2)
[Dep. Fish. Allied Aquacult., Auburn Univ., Auburn, AL 36830]

82-001273 Prewitt, C. G. and C. A. Carlson. EVALUATION OF FOUR INSTREAM FLOW METHODOLOGIES USED ON THE YAMPA AND WHITE RIVERS, COLORADO. *U.S. Bur. Land Manage. (Denver, Colo.) Biol. Sci. Ser.* No. 2. iv + 65p. 1980. SFA 27(2)
[Dep. Fish. Biol., Colo. State Univ., Fort Collins 80521] Four stream flow assessment methodologies were applied to selected reaches of the middle Yampa and White Rivers in Colorado. These were 1) The Tennant method, 2) R-2 Cross, 3) WSP, and 4) the incremental analysis method developed by the Cooperative Instream Flow Service Group (IFG) of the U.S. Fish and Wildlife Service in Fort Collins, Colorado. The methodologies were applied in accordance with standard published procedures or criteria supplemented by various agencies. The flow recommendations were evaluated against actual field observations of physical and biotic conditions in both rivers and against weighted usable area predictions from the IFG incremental model. Flow requests from the Tennant method (30 percent of mean annual flow) were acceptable for the White River but unnecessarily high for the Yampa River. R-2 Cross flow requests varied considerably depending upon cross sectional placement but the "best" request was considered adequate for both rivers. WSP requests approximated those of R-2 Cross and were also considered adequate. The flow level derived from the first three methodologies (200 cubic feet per second (cfs) was analyzed in a two species contrast with the IFG methodology and found to provide critically low habitat for Colorado squawfish while offering near optimum conditions for channel catfish. Minimum flows in such rivers should be evaluated on a flow regime rather than a long-term minimum flow basis. Cost and time evaluations were also conducted. The various field procedures required approximately equal cost and time inputs, but the IFG incremental analysis offered the greatest analytic advantages.

82-001274 Williamson, N. J. CLUSTER SAMPLING ESTIMATION OF THE VARIANCE OF ABUNDANCE ESTIMATES DERIVED FROM QUANTITATIVE ECHO SOUNDER SURVEYS. *Can. J. Fish. Aquatic Sci.* 39(1):229-231. Jan. 1982. In English with French summ. SFA 27(2)
[NMFS, Northwest Fish. Cent., Seattle, WA 98112]

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82-001275 Darracott, D. A. and A. C. Brown. BIBLIOGRAPHY OF MARINE BIOLOGY IN SOUTH AFRICA. *S. Afr. Natl. Sci. Prog. Rep.* No. 41. vii + 239p. Feb. 1980. Available from Publ. Div., CSIR, P.O. Box 395, Pretoria 0001, South Africa. SFA 27(2)

82-001276 FAO of the UN. WORLD LIST OF AQUATIC SCIENCES AND FISHERIES SERIAL TITLES. *FAO Fish. Tech. Pap.* No. 147(suppl. 4). x + 120p. Feb. 1980. SFA 27(2)
[Rome, Italy]

REVIEWS, BIBLIOGRAPHIES, ETC. (CONTINUED)

82-001277 Scarlett, P. G. ANNOTATED BIBLIOGRAPHY AND SUBJECT INDEX ON THE SUMMER FLOUNDER, *PARALICHTHYS DENTATUS. NOAA Tech. Rep. NMFS SSRF* 755. iii + 12p. Mar. 1982. SFA 27(2)
[Nacote Creek Mar. Fish. Lab., N.J. Div. Fish Game Wildl., Star Route, Absecon 08201]

# AUTHOR INDEX

Able, K. W.
82-001206
Ackerman, R. A.
82-000652
Adams, P. B.
82-000589
Adron, J. W.
82-000552
Agrawal, V. P.
82-000670
Ajayi, T. O.
82-000901
Akiba, Y.
82-001219
Al-Ahmad, T. A.
82-000558
Alcalde, C.
82-001063
Alderman, D. J.
82-001048
Alevizon, W. S.
82-000816
Alexander, J. B.
82-001039
Ali, N. M.
82-001061
Allendorf, F. W.
82-001198
Allendorf, F.W.
82-000761
Altringham, J. D.
82-000634
Altukhov, Yu. P.
82-000762
82-000763
Alvarez Leon, R.
82-001062
Anderson, L. G.
82-001180
Anderson, M.
82-000997
Andersson, M.
82-000824
Ando, S.
82-000635
Andreucci, R. D.
82-000590
Anma, G.
82-001219
Applegate, R. L.
82-000893
Arai, S.
82-000561
Archibald, C. P.
82-000575
82-000854
Arieli, Y.
82-000560
Armantrout, N. B.
82-001151
82-001152
Arme, C.
82-001073
Aro, E.
82-000855
82-000856
Aron, W.
82-001153
Atkinson, R. J. A.
82-000644
Atton, F. M.
82-001101
Au, R.-J.
82-000592
Auvinen, H.
82-001240
82-001242
Avault, J. W., Jr.
82-000504
Avnimelech, Y.
82-000534
Badcock, J.
82-000591
82-000998
Bagenal, T. B.
82-001228
Bagge, P.
82-000902
Bahuguna, S. N.
82-000903
Bailey, R. M.
82-000961
82-001022
Baird, T. A.
82-000671
Balasubramanian, N. K.
82-000919
Ball, J. N.
82-000636
Ball, R. L.
82-000944
Bally, M.
82-001144
Balsamo, M.
82-000815
Barash, H.
82-000523
Barnett, C.
82-000791
Barros, C.
82-001063
Barry, J. P.
82-001261
Barton, B. A.
82-000565
Barton, M.
82-000792
Baugh, T. M.
82-000637
Baumgartner, J. V.
82-000999
Bayne, D. R.
82-000581
Beadles, J. K.
82-000525
Beamish, F. W. H.
82-001124

# AUTHOR INDEX

Beamish, R. J.
82-000945
Beeven, H.
82-000933
Becker, C. D.
82-001094
82-001114
82-001170
Behmer, D. J.
82-000519
Behrens Yamada, S.
82-001188
Beitinger, T. L
82-000798
82-001122
Bejarano, R.
82-000859
Bek, J. R.
82-000851
Belanger, S. E.
82-000952
82-001115
Bentley, T. B.
82-000793
Berra, T. M.
82-000592
82-000638
Berst, A. H.
82-001154
82-001168
Bertelsen, E.
82-001000
Best, A. C. G.
82-000593
Beulig, A.
82-000794
Bhattacharya, S.
82-000707
Bhattacharyya, T. K.
82-000594
Bieniarz, K.
82-000526
Biette, R. M.
82-000830
Bigelow, S. M.
82-000579
Billard, R.
82-000515
82-000639
82-000640
82-000641
82-000669
Binns, N. A.
82-000831
Blackie, J. R.
82-001171
Blanc, J. M.
82-000648
Blaxter, J. H. S.
82-000610
Bleckmann, H.
82-000642
Bodaly, R. A.
82-000575
Boehlert, G. W.
82-000946
Boehmke, J. R.
82-000576
Boese, B. L.
82-001135
Bohemen, C. G. van
82-000643
Bohnsack, J. A.
82-000904
Bolan, K.
82-000666
Bond, C. E.
82-000858
Bondari, K.
82-000524
Booke, H. E.
82-000772
82-000777
82-001155
Booker, O. J.
82-001049
Borgeson, D.
82-000784
Borgeson, D. P.
82-001229
Bottroff, L. H.
82-001175
Bower, C. E.
82-000566
Bowers, A.
82-001039
Bowne, P. S.
82-000595
Bowser, P. R.
82-001050
Boyd, C. E.
82-000503
82-001214
82-001272
Branchek, T. A.
82-000596
Brannon, E. L.
82-000827
Brawn, V. M.
82-000875
Bregazzi, P. R.
82-001090
Breton, B.
82-000641
82-000669
Brett, B. L. H.
82-000795
82-000796
Bridges, C. R.
82-000644
Briggs, H.
82-001221
Britski, H. A.
82-000590
Bronmark, C.
82-000925
Bronzi, P.
82-000672

Brooke, L. T.
82-001137
Brown, A. C.
82-001275
Brown, A. F.
82-000769
Brown, E. H., Jr.
82-000508
82-001230
Brown, L. R.
82-000959
Bruce, W. J.
82-000962
Brunson, M. W.
82-000557
Brussard, P. F.
82-000764
Buck, R. J. G.
82-000891
Buckley, L. J.
82-000645
Bullock, T. H.
82-000746
Burgess, J. W.
82-000797
Burr, B. M.
82-000618
82-000832
Burzawa-Gerard, E.
82-000646
82-000740
Busakhin, S. V.
82-001001
Buth, D. G.
82-000765
Butler, D. G.
82-000594
Butler, W.
82-000787
Buynak, G. L.
82-000877
Cadieux, C.
82-000991
Cailliet, G. M.
82-000947
82-001261
Cairns, J., Jr.
82-001091
Cairns, M. A.
82-001116
Calhoun, S. W.
82-000798
Callard, G. V.
82-000695
Campbell, S. G.
82-000576
Cange, S.
82-000504
Caplins, W. C.
82-001220
Capper, B. S.
82-000550
Cardenete, G.
82-000728
Carignan, R.
82-000568
Carline, R. F.
82-000922
Carlisle, T. R.
82-000876
Carlson, C. A.
82-001273
Carneiro, J.
82-000590
Carr, B. A.
82-000505
Carranza, F.
82-001270
Carvajal, J.
82-001063
Cashon, R. E.
82-000766
Casselman, J. M.
82-000767
82-000772
Casterlin, M. E.
82-000799
82-000817
Castric, J.
82-001058
Cech, J. J., Jr.
82-000647
82-000959
82-001163
Ceschia, G.
82-001044
Chadwick, E. M. P.
82-000962
Chakroff, M. S.
82-000506
Chamberlain, J. B.
82-000676
Chan, G. L.
82-001082
Chapman, D. E.
82-001135
Charlon, N.
82-000648
Chernoff, B.
82-001002
Cherry, D. S.
82-001091
Chervinski, J.
82-000569
Cheung, P. J.
82-001064
Childers, W. F.
82-000778
Chilton, D. E.
82-000945
Ching, H. L.
82-001065
Chittenden, M. E., Jr.
82-000847
Chrisman, C. L.
82-000789
82-000790

# AUTHOR INDEX

Christie, P.
82-000722
Christie, W. J.
82-000837
Chung, K. S.
82-001092
Cichra, C. E.
82-000649
82-001254
Cilia, A.
82-001064
Cipriano, R. C.
82-001040
82-001041
82-001042
Clady, M. D.
82-000897
Claiborne, J. B.
82-000650
Clark, D. T.
82-000800
Clayton, D. A.
82-000801
Clayton, J. W.
82-000857
Clugston, J. P.
82-001172
Coad, B. W.
82-001003
Coates, L. J.
82-000905
Coberly, C. E.
82-001230
Cohen, A. H.
82-000651
Cohen, D. M.
82-001004
Colby, P. J.
82-000768
Coles, T. F.
82-000781
Colgan, P. W.
82-001117
Collins, J. J.
82-000767
Collins, J. P.
82-000987
Combs, D. L.
82-001256
Compagno, L. J. V.
82-000623
82-000834
Cone, D. K.
82-001057
82-001066
Conrad, J. F.
82-001043
Coombs, C.
82-000858
Cooper, S. D.
82-000580
Corcoran, M. F.
82-001005
Corey, S.
82-000585
Courtois, L. A.
82-001173
Cowey, C. B.
82-000552
Crabtree, R. E.
82-000963
Crandall, T. A.
82-001050
Crass, D. W.
82-001114
Cravedi, J. P.
82-001093
Crawford, T. G.
82-000525
Crawshaw, L. I.
82-000652
Crim, L. W.
82-000653
Crist, L.
82-000906
Crites, J. L.
82-001074
Crone, R. A.
82-000516
Cross, F. B.
82-000770
Cross, J. A.
82-001117
Crossman, E. J.
82-000767
Crouse, M.
82-001152
Cuker, B. E.
82-000867
Current, W. L.
82-001049
Dabrowski, K.
82-000542
82-000654
Dabrowski, K. R.
82-000655
Dailey, D. C.
82-000972
Dailey, J. T.
82-000972
Daniels, R. A.
82-000964
Darling, J. D. S.
82-000943
Darracott, D. A.
82-001275
Dasgupta, J. D.
82-000597
Daugherty, C. H.
82-000769
Davie, P. S.
82-000656
Davies, I. J.
82-000586
Davies, R. M.
82-001174

# AUTHOR INDEX

Davies, W. D.
82-001226
Dawson, C. E.
82-001006
82-001007
Daxboeck, C.
82-000657
Day, E. J.
82-000557
de Kinkelin, P.
82-001058
de Silva, S. S.
82-001008
Deacon, J. E.
82-000988
Dean, J. M.
82-000629
82-000963
Dehring, T. R.
82-000769
82-001198
Delage, A.
82-001223
Delfino, J. J.
82-001141
Della Corte, F.
82-000721
Demayo, A.
82-001143
Demory, R. L.
82-000954
Demski, L. S.
82-000598
82-000658
Denner, M. W.
82-000972
DesJardine, R. L.
82-000837
82-001199
DeVries, A. L.
82-000717
DeVries, D. A.
82-001265
Diana, J. S.
82-000659
Diaz Luna, J. L.
82-001009
Diaz-Machuca, J. L.
82-000833
Dick, T. A.
82-001067
DiJulio, D.
82-001121
Dill, L. M.
82-001223
Dillmann, D. W.
82-000645
Dimaline, R.
82-000686
DiMattio, J.
82-000660
Djabali, M.
82-000661

...CONTINUED...
Djabali, M.

82-000720
Dodge, D. P.
82-000830
Donaldson, E. M.
82-000570
Doneen, B. A.
82-000662
Donohoe, C. J.
82-000892
Dooley, J. K.
82-001014
Doucet, G. J.
82-001077
Douglas, R. H.
82-000599
82-000802
Douthwaite, R. J.
82-001102
Drenner, R. W.
82-000770
82-000907
82-000908
82-000937
Drewry, G. E.
82-000933
Dronen, N. O., Jr.
82-001068
Dubin, R. E.
82-000803
DuBois, A. B.
82-000718
Dumont, P.
82-000991
Dunant, Y.
82-000663
Durbin, A. G.
82-000664
Durbin, E. G.
82-000664
Dutil, J.-D.
82-000990
Dutta, H. M.
82-001118
Eales, J. G.
82-000665
82-000702
Eck, G. W.
82-001230
Edsall, C. C.
82-000989
Edwards, A. J.
82-000965
Egginton, S.
82-000600
Eklund, M. W.
82-001043
Ellertsen, B.
82-000909
Elner, J. K.
82-001149
Elsarnagawy, D.
82-001032

Emery, A. R.
82-001010
Engelhardt, F. R.
82-001129
Epler, P.
82-000526
Erdheim, E.
82-001156
Ernst, M. E.
82-000966
Erwteman-ooms, E. E. A.
82-001089
Evans, D. H.
82-000650
Evans, D. O.
82-000837
82-001160
82-001199
Evans, W. A.
82-001244
Evenson, E. J.
82-000543
Ezeasor, D. N.
82-000601
Fagade, S. O.
82-000910
Fange, R.
82-000602
FAO of the UN
82-001266
82-001276
Farquhar, B. W.
82-001254
Farr, J. A.
82-000771
Fast, A. W.
82-001175
Fay, R. R.
82-000666
Felton, S. P.
82-001121
Fendrick, J. L.
82-001059
Ferguson, A. J. D.
82-000584
Ferguson, H. W.
82-001124
Fernando, C. H.
82-001082
Ferro, R. S. T.
82-001204
82-001205
Fetterolf, C. M., Jr.
82-001231
Fiandt, J. T.
82-001120
Fickeisen, D. H.
82-001094
82-001170
Filipek, S.
82-001187
Fink, W. L.
82-000603
Finlayson, J. E.
82-001069
Fisher, T. R.
82-001216
FitzGerald, G. J.
82-000941
82-000990
Flescher, D. D.
82-000604
Fletcher, G. L.
82-000665
82-000667
Flick, W. A.
82-001203
Flickinger, S. A.
82-000564
Flint, A. P. F.
82-000730
Foell, E. J.
82-000809
Foltz, J. W.
82-000544
Forberg, K. G.
82-000605
Ford, E. D.
82-001171
Forster, R. P.
82-000729
Forstner, H.
82-000685
Fortin, R.
82-000862
82-000950
82-000991
Foskett, J. K.
82-000668
Foster, N. R.
82-001230
Foster, S. A.
82-000900
Fostier, A.
82-000641
82-000669
Fournie, J. W.
82-001055
Fournier, H.
82-000991
Fowler, L. G.
82-000521
Fox, P. J.
82-001102
Fraser, J. M.
82-001194
Freeman, L. A.
82-001122
Freeze, M.
82-000507
82-001181
Fricke, R.
82-001011
Fritch, J. D.
82-000538
Fuchs, J.
82-000539

...CONTINUED...
Fuchs, J.
82-000545
Fugii, R.
82-000606
Fujita, S.
82-000696
Gabriel, W. L.
82-000911
Gale, W. F.
82-000877
Gallepp, G. W.
82-000697
Gandolfi, G.
82-000815
Garcia, M.
82-000728
Gardner, P. N.
82-001222
Garg, V. K.
82-000670
Garrett, G. P.
82-000608
82-000878
Garton, R. R.
82-001116
Gas, N.
82-000714
Gaten, E.
82-001083
Gatesoupe, F.-J.
82-000546
82-000547
Gatlin, D. M. III
82-000548
Gaudet, J.-L.
82-001157
Geen, G. H.
82-001147
Geraudie, J.
82-000607
Gerritsen, J.
82-001223
Gerstung, E. R.
82-001245
Gharrett, A. J.
82-001198
Ghion, F.
82-000912
Giattina, J. D.
82-001091
Giavenni, R.
82-001033
Gibson, J. M.
82-000544
Giguere, L. A.
82-001223
Gilbert, C. R.
82-001002
Gill, H. S.
82-000522
Gillespie, J. H.
82-001113
Gilmore, R. G.
82-000892
Giorgetti, G.
82-001044
Goetz, F. W.
82-000738
Goldman, C. R.
82-000580
Goldspink, G.
82-000709
Goldstein, L.
82-000650
82-000729
Goldstein, R. M.
82-001108
Golimowski, J.
82-001095
Golovanov, V. K.
82-000700
Golub, L.
82-000819
Goodfellow, W. L., Jr.
82-000967
Goodier, J. L.
82-001232
Goos, H. J. T.
82-000643
Gophen, M.
82-000908
Gordon, D. M.
82-001070
Graham, J. B.
82-000671
Gray, J. A. B.
82-000593
Gray, P. L.
82-000948
Gray, R. H.
82-000672
Greenfield, D. W.
82-001012
Greenfield, T. A.
82-001012
Greenwood, P. H.
82-000609
Grimaldi, M. C.
82-000721
Grimes, C. B.
82-001206
Grizzle, J. M.
82-000631
Groberg, W. J., Jr.
82-001059
Grodzinski, Z.
82-000613
Grosse, D. J.
82-000796
Gruber, S. H.
82-000673
82-000805
82-000834
82-000924
Gueze, P.
82-001020
Guillen, G. J.
82-000968

# AUTHOR INDEX

- Guillory, V.
  - 82-000859
  - 82-000969
  - 82-001207
  - 82-001210
- Gupta, O. P.
  - 82-000674
- Gustavsson, I.
  - 82-001095
- Haas, M. A.
  - 82-001186
- Haas, R.
  - 82-000835
- Hacunda, J. S.
  - 82-000913
- Hadley, W. F.
  - 82-001071
- Haghighi, A. Z.
  - 82-001118
- Hagstrom, N. T.
  - 82-001034
- Hains, T. A.
  - 82-001103
- Hakkari, L.
  - 82-000902
- Hale, M. M.
  - 82-000581
- Hales, D. C.
  - 82-000845
  - 82-001084
- Halfon, E.
  - 82-000994
- Hall, M. C.
  - 82-000764
- Hallerman, E. M.
  - 82-001255
- Halling, F.
  - 82-000860
- Hallock, R. J.
  - 82-001202
- Hamilton, S.
  - 82-001103
- Hamilton, T. A.
  - 82-001217
- Hanke, W.
  - 82-000674
  - 82-000678
- Hanna, P. J.
  - 82-001119
- Hannah, J. B.
  - 82-001121
- Hansell, D. A.
  - 82-001214
- Hanson, J. M.
  - 82-000861
- Hanzel, D. A.
  - 82-000937
- Hara, A.
  - 82-000743
- Harada, K.
  - 82-000914
  - 82-001045
- Harmon, P. R.
  - 82-000889
- Harper, D. M.
  - 82-000584
- Harrell, R. M.
  - 82-000949
- Harris, F. A.
  - 82-000841
- Harris, V. A.
  - 82-001107
- Harrison, E. J.
  - 82-001071
- Harrison, W. G.
  - 82-000588
- Hart, N. H.
  - 82-000675
- Harvey, B.
  - 82-000676
- Harvey, G.
  - 82-000862
  - 82-000950
- Haschemeyer, A. E. V.
  - 82-000677
- Hashim, M. T.
  - 82-000951
- Hassinger, R. L.
  - 82-000830
- Hay, D. E.
  - 82-001189
- Hayase, S.
  - 82-000804
- Hayashi, F.
  - 82-001045
- Heath, M. E.
  - 82-000652
- Hegab, S. A.
  - 82-000678
- Heimbuch, D. G.
  - 82-001243
- Heinrich, D.
  - 82-000970
- Helfrich, L. A.
  - 82-001195
  - 82-001197
  - 82-001201
- Helle, J. H.
  - 82-000508
  - 82-000517
- Heming, T. A.
  - 82-000679
- Henderson-Arzapalo, A.
  - 82-000527
- Henderson, B.
  - 82-000784
- Henderson, E. B.
  - 82-000889
- Henderson, S.
  - 82-000507
  - 82-001181
- Hendricks, J. D.
  - 82-001145
- Hendricks, M. L.
  - 82-001096
- Hendrickson, D.
  - 82-001196

# AUTHOR INDEX

Henley, D. T.
82-000893
Heppell, D.
82-001026
Herman, R. L.
82-001072
Hew, C. L.
82-000667
Hickey, C. R., Jr.
82-000680
Hickey, G. M.
82-000681
Hickman, T. J.
82-001233
Hillery, C. M.
82-000666
Hilton, J. W.
82-000682
82-000683
Hoar, W. S.
82-000684
Hocutt, C. H.
82-001096
Hodson, P. V.
82-000683
Hofer, R.
82-000685
Hoffman, G. L.
82-001081
Hogler, S. R.
82-000952
Hoines, L. J.
82-001185
Holcombe, G. W.
82-001120
Holden, A. V.
82-001097
Holliday, J. E.
82-000573
Holloway, H. L., Jr.
82-001034
Holmes, P. J.
82-000651
Holmes, S. B.
82-001142
Holmgren, S.
82-000686
Honda, H.
82-000879
82-000880
Honda, K.
82-001208
Hoole, D.
82-001073
Hooper, G. R.
82-001178
Hope, S. J.
82-000540
Horbert, W. R.
82-000758
Hornby, P. J.
82-000658
Horne, J. E. M.
82-001171
Horowitz, L.
82-000509
Horrall, R. M.
82-000863
82-001230
Hose, J. E.
82-001121
Hoss, D. E.
82-000610
Hourston, A. S.
82-000881
82-000915
Houston, A. H.
82-000687
Howick, G. L.
82-000916
Hoyer, M. V.
82-001234
Hoyt, R. D.
82-001246
Hubbs, C.
82-000836
Hudson, P. L.
82-001257
Huebner, J. D.
82-000688
Hueter, R. E.
82-000805
Huey, D. W.
82-001122
Hughes, G. M.
82-000611
Hulata, G.
82-000528
82-000725
Hunt, S. M. V.
82-000689
Hunter, G. A.
82-000570
Hussien, S. A.
82-001035
Huth, A.
82-000690
Hyatt, K. D.
82-000917
Hynes, J. D.
82-000508
Ihssen, P. E.
82-000767
82-000772
82-000837
Ikeda, S.
82-000756
82-000757
Ikeda, Y.
82-000691
82-000692
Ikonen, E.
82-001240
Iles, T. D.
82-000585
82-000864
82-000955

Ilyenkova, S. A.
82-000773
Ina, K.
82-000549
Ince, B. W.
82-000693
Ingram, K. M.
82-001051
Inoue, M.
82-001045
International Council for the Exploration of the Sea
82-001098
82-001209
82-001267
Irwin, B.
82-000588
Itada, M.
82-000751
Itzkovich, J.
82-000725
Iwaoka, W. T.
82-001121
Jackson, A. J.
82-000550
Jacob, S. S.
82-000918
82-000919
Jasim, B. M.
82-000846
Jauncey, K.
82-000551
Jenkins, R. M.
82-001258
Jensen, A. J.
82-000953
Jensen, A. L.
82-000865
82-001217
82-001218
Jester, D. B.
82-000866
Jilek, R.
82-001074
Johansen, K.
82-000739
Johansen, P. H.
82-001117
Johnsen, B. O.
82-000953
Johnson, D. L.
82-000567
Johnson, J. E.
82-001158
Johnson, M. S.
82-001027
Johnson, V. G.
82-001135
Johnston, I. A.
82-000600
82-000634
Jones, B. W.
82-000782
Jones, J. R.
82-001234
Jones, M. V.
82-000709
Jones, P. L.
82-000694
Jones, P. W.
82-000933
Jones, R. I.
82-000841
Jorgensen, P. E. V.
82-001060
Joshi, S. B.
82-000667
Justines, G.
82-000723
Kagawa, H.
82-000619
82-000708
Kahan, D.
82-000509
Kanno, Y.
82-000838
Kapetsky, J. M.
82-001262
Katoh, J.
82-000510
Kauffman, J.
82-000971
Kautz, R. S.
82-001235
Kavaliers, M.
82-000806
Kawai, K.
82-001046
Kazakov, R. V.
82-000773
Keen, W. H.
82-000920
Kendall, A. W., Jr.
82-000894
Kendall, W. T.
82-001195
82-001197
82-001201
Kennedy, C. R.
82-001090
Kepner, W. G.
82-000882
Kerr, S.
82-000915
Kerr, S. R.
82-000779
Keyes, R.
82-000807
Khan, R. A.
82-001052
Khangarot, B. S.
82-001123
Khuda-Bukhsh, A. R.
82-000774
Kikuchi, M.
82-001146

# AUTHOR INDEX

Kikuchi, Y.
82-000611
Kilarski, W.
82-000613
Kilham, P.
82-001216
Kime, D. E.
82-000695
Kimmel, W. G.
82-001099
Kimura, S.
82-000921
Kinghorn, B. P.
82-000511
82-000571
Kinsman, D. J. J.
82-001171
Kirschbaum, F.
82-000750
Kitabatake, Y.
82-001224
Kitajima, C.
82-000696
Kleiner, C. F.
82-001192
Klinger, S. A.
82-000697
Klootwijk-Vandijk, E.
82-000734
Knap, A. H.
82-001140
Knight, M. J.
82-001107
Knight, R. L.
82-000922
Knox, D.
82-000552
Knuth, M. L.
82-001137
Kobayashi, K.
82-000914
Kock, R. L.
82-000992
Kodric-Brown, A.
82-000883
Koerner, J. F.
82-000948
Kohler, C. C.
82-001259
Koonce, J. F.
82-000784
82-001168
Koops, H.
82-000529
Kornfield, I. L.
82-000612
Kortmulder, K.
82-001008
Kozel, T. R.
82-000972
Kozlowska, H.
82-000542
Kramer, D. L.
82-000698
Krasnicki, K.
82-000542
Kratz, K.
82-000923
Kreuz, K. F.
82-000954
Kriste, W. H., Jr.
82-000809
Krueger, C. C.
82-000775
82-001198
Kruse, G. H.
82-000954
Kruse, K. C.
82-000543
Kucera, P. A.
82-000852
Kuenzer, P.
82-000808
Kuhlmann, H.
82-000529
Kulka, D. W.
82-000585
82-000895
Kulshrestha, A. K.
82-001075
Kumaraguru, A. K.
82-001124
Kunimine, I.
82-001045
Kuroki, T.
82-000813
Kusher, D.
82-000947
Kusuda, R.
82-001046
Kutkuhn, J. H.
82-001236
LaBounty, J. F.
82-000576
Lacy, E. J., Jr.
82-000957
Lall, S. B.
82-001118
Lam, T. J.
82-000512
82-000513
Lambert, J. G. D.
82-000643
Lamsa, A.
82-000784
Landis, W. J.
82-000607
Landolt, M. L.
82-001121
Landry, A. M.
82-000968
Landye, J. J.
82-000582
Lange, R. H.
82-000613
Langille, R. M.
82-000759

## AUTHOR INDEX

Langton, R. W.
82-000688
Lanzing, W. J. R.
82-000699
Lapkin, V. V.
82-000700
Lark, J. G. I.
82-000554
Larkin, P. A.
82-000514
82-000779
Larking, P. A.
82-000776
Larrick, S. R.
82-001091
Last, F. T.
82-001171
Lauder, G. V.
82-000609
Lavenberg, R. J.
82-001000
Lawson, C. S.
82-001178
Leach, P. J.
82-001251
Leaman, B. M.
82-000854
Leary, R.
82-000777
Leatherland, J. F.
82-000701
Lebo, J. R.
82-000967
Lee, D. P.
82-001247
Legendre, M.
82-000669
Leggett, W. C.
82-000861
Leis, J. M.
82-000614
Lemly, A. D.
82-001076
Leong, J. C.
82-001059
Leosch, J. G.
82-000809
Leslie, A. J., Jr.
82-000884
Levin, G. B.
82-000702
Levine, J. S.
82-000810
Levy, D. A.
82-000839
Lewis, D. J.
82-001077
Lewis, D. S. C.
82-000840
Lewis, G. E.
82-001100
Lewis, W. M.
82-000537
Liaw, W. K.
82-001101
Libey, G. S.
82-000789
82-000790
Liley, N. R.
82-000811
Lin, H.-R.
82-000530
Lindsay, J. M.
82-001220
Lindsey, C. C.
82-000575
82-000615
Linfoot, B. T.
82-000541
Lipps, J. H.
82-000964
Loeng, H.
82-000909
Loftus, K. H.
82-001159
Lomholt, J. P.
82-000739
Lone, K. P.
82-000531
Longval, M. J.
82-000924
Lopez S., M. I.
82-001013
Lorenzen, W. E.
82-001257
Low, R. A.
82-000993
Loyacano, H. A., Jr.
82-000949
Lubbock, H. R.
82-000965
Lubbock, R.
82-001021
Ludke, J. L.
82-001103
Luquet, P.
82-000547
Lux, F. E.
82-000896
Lykkeboe, G.
82-000744
Mac, M. J.
82-000989
MacCrimmon, H. R.
82-000812
MacDonald, R. E.
82-000573
Mackay, W. C.
82-001126
MacLean, J. A.
82-001160
82-001199
MacLennan, D. N.
82-001190
MacNichol, E. F., Jr.
82-000810

# AUTHOR INDEX

Maeda, H.
82-000914
Maemets, A.
82-001238
Magnuson, J. J.
82-000697
Maitipe, P.
82-001008
Maitland, P. S.
82-000784
82-000973
82-001161
Malmqvist, B.
82-000925
Mandal, P. K.
82-001075
Mann, R. H. K.
82-000926
Marenchin, G. L.
82-000974
Margraf, F. J.
82-000922
Marian, M. P.
82-000553
Marino, R. P.
82-001014
Markle, D. F.
82-000905
Marlot, S.
82-000669
Marosz, E.
82-000526
Marriott, R. A.
82-000948
Martin, F. D.
82-000933
Martin, J.
82-000554
Martin, L.
82-000947
Martin, N. V.
82-001199
Matallanas, J.
82-000927
Mathews, R. W.
82-000677
Mathews, S. B.
82-000993
Mathias, J. A.
82-000554
Matsumiya, M.
82-000703
Matsushita, K.
82-000872
Matthews, W. J.
82-000851
82-000976
Matthews, W. M.
82-000975
Matthiessen, P.
82-001102
82-001125
Matty, A. J.
82-000531

...CONTINUED...
Matty, A. J.

82-000550
Matuda, K.
82-001208
Maxwell, J. G. H.
82-001078
Mayden, R. L.
82-000832
Mayer, F. L.
82-001103
McArthur, C. P.
82-001053
82-001079
McBride, F. T.
82-000841
McClellan, D. B.
82-001269
McClure, M.
82-000698
McComas, S. R.
82-000908
McCormick, C. A.
82-000616
McCray, E. M., Jr.
82-001150
McDaniel, R.
82-000975
McDonald, D. G.
82-000754
McDonald, J.
82-001248
McDonald, M. E.
82-000867
McFadden, C. A.
82-001130
McGeachin, R. B.
82-001215
McGlade, J. M.
82-000772
McHugh, J. L.
82-001182
McIntyre, J. D.
82-001202
McKeown, B. A.
82-001147
McMahon, B. R.
82-000754
McNulty, J. A.
82-000704
McVicar, A. H.
82-001080
McWilliams, P. G.
82-000705
Mearow, K. M.
82-000687
Medel-Ulmer, L.
82-000842
Meffe, G. K.
82-000987
82-001162
Mehrle, P. M.
82-001103

Melack, J. M.
82-001216
Meriwether, F. H. II
82-000572
Meriwether, F. II
82-000532
Merrick, J. R.
82-000885
Metcalf, M. T.
82-000567
Methot, R. D., Jr.
82-000868
Meunier, F. J.
82-000617
82-000626
82-000633
Midgley, S. H.
82-000885
Midttun, L.
82-000977
Mihursky, J. A.
82-000933
Mikami, T.
82-001219
Miley, W. W. II
82-000884
Miller, B. S.
82-001121
Miller, C.
82-001207
82-001210
Miller, C. A.
82-001099
Miller, N. W.
82-001036
82-001037
Miller, R. L.
82-001175
Miller, R. R.
82-001002
Miller, T. G.
82-001126
Milles, D. H.
82-001035
Mills, E. L.
82-000583
Miltner, M.
82-000504
Minckley, W. L.
82-001176
82-001249
Mishra, A. P.
82-000733
Mitchell, A. J.
82-001081
Mitchell, D. F.
82-000886
Mitchell, K. A.
82-000783
Mitchell, L. G.
82-001051
Mitsuhashi, S.
82-001045
Miura, T.
82-001211
Miyamoto, Y.
82-000706
Miyashita, Y.
82-000606
Moav, R.
82-000523
82-000528
Mokady, S.
82-000560
Molnar, K.
82-001082
Montgomery, J. C.
82-001170
Moodie, G. E. E.
82-000887
Moody, J.
82-001083
Moon, T. C.
82-001099
Moore, A. R.
82-001057
Moore, D. E.
82-001200
Moorhouse, P.
82-001171
Mork, O. I.
82-000518
Morris, M. A.
82-000618
Morrison, J.
82-001086
Morrison, J. D.
82-000638
Morton, W. M.
82-000928
Moyle, P. B.
82-001163
82-001166
Mozley, S. C.
82-000867
Msiska, O. V.
82-000533
Mukherjee, D.
82-000707
Muller, M.
82-001225
Mulligan, T. J.
82-000848
82-001188
Mummert, J. R.
82-000907
Munroe, B.
82-000583
Murabayashi, K.
82-001271
Murai, T.
82-000555
82-000813
Muramoto, S.
82-001127
82-001128

# AUTHOR INDEX

Murray, K. R.
82-000541
Musick, J. A.
82-000623
Nagahama, Y.
82-000619
82-000708
Nagelkerken, W. P.
82-000978
Nahhas, R.
82-000709
Nair, N. B.
82-000918
82-000919
Nakamura, M.
82-000710
82-000711
Nakari, T.
82-001132
Nakken, O.
82-000977
Nall, L. E.
82-000884
Naplin, N. A.
82-000894
Narain, A. S.
82-001109
82-001138
Narayanan, M.
82-000553
Nath, P.
82-000740
Nava, M. E.
82-001129
Neff, J. M.
82-001144
Neill, W. H.
82-000649
Neitzel, D. A.
82-001094
Nelson, J. A.
82-001104
Nepszy, S. J.
82-000768
Nero, R. W.
82-000586
Nesterov, V. D.
82-001015
Neumann, D. A.
82-001105
Newman, M. W.
82-001052
Ney, J. J.
82-001259
Nichy, F. E.
82-000896
Nicolas, G.
82-000632
Nielsen, J.
82-000966
Nielsen, L. A.
82-001201
Nieman, D. A.
82-000897
Niemi, M.
82-001106
Nigrelli, R. F.
82-001064
Niimi, A. J.
82-001130
Nikinmaa, M.
82-000712
82-000713
Nilsson, N. A.
82-001161
Noaillac-Depeyre, J.
82-000714
Noble, R. L.
82-000649
82-001254
Nordlie, F. G.
82-000715
Nordlie, W. C.
82-000715
Norris, R. M., Jr.
82-001250
Northcote, T. G.
82-000839
Nose, T.
82-000555
Nose, Y.
82-000872
Nye, G. D.
82-001185
Nystrom, R. R.
82-001131
O'Brien, W. J.
82-000907
O'Connell, C. P.
82-000716
O'Connor, J. M.
82-001105
O'Grady, S. M.
82-000717
Ogata, H.
82-000555
Ogilvy, C. S.
82-000718
Oglesby, R. T.
82-001237
Ohsuga, H.
82-000549
Oikari, A. O. J.
82-001132
Okamoto, M.
82-000813
Okuda, H.
82-000741
Oldham, R. S.
82-000938
Oordt, P. G. W. J. van
82-000643
Osse, J. W. M.
82-001225
Otake, S.
82-000703
Otten, E.
82-000620

# AUTHOR INDEX

- Overstreet, R. M.
  - 82-001055
  - 82-001139
- Ozaki, H.
  - 82-000691
  - 82-000692
- Pacific Fishery Management Council
  - 82-001268
- Page. T. L.
  - 82-000672
- Palmork, K. H.
  - 82-001140
- Paloma, P. A.
  - 82-000716
- Pandey, K.
  - 82-000814
- Pang, P. K. T.
  - 82-000636
- Papst, M.
  - 82-000554
- Parmanne, R.
  - 82-000856
  - 82-000869
  - 82-000870
  - 82-000871
- Parsons, J. E.
  - 82-000558
- Part, P.
  - 82-000621
- Pasdar, M.
  - 82-001255
- Patalas, K.
  - 82-000575
- Pawaputanon, O.
  - 82-000936
- Paxton, J. R.
  - 82-001016
- Payne, J. F.
  - 82-001133
- Payne, N. R.
  - 82-000772
- Pearcy, W. G.
  - 82-000911
- Peck, L. W.
  - 82-001043
- Peden, A. E.
  - 82-001017
- Pennington, C. H.
  - 82-001212
- Perlmutter, A.
  - 82-000724
- Persat, H.
  - 82-001191
- Persson, L.-E.
  - 82-000929
- Pesaro, M.
  - 82-000815
- Pestrak, J. M.
  - 82-000731
- Peter, R. E.
  - 82-000565
  - 82-000719
- Peterson, N. E.
  - 82-001043
- Phelps, S. R.
  - 82-000761
  - 82-000769
- Philipp, D. P.
  - 82-000778
  - 82-001255
- Phillips, P. C.
  - 82-000979
- Phipps, G. L.
  - 82-001120
- Pic, P.
  - 82-000661
  - 82-000720
- Pica, A.
  - 82-000721
- Pickering, A. D.
  - 82-000722
- Pidgeon, R. W. J.
  - 82-000930
- Pietsch, T. W.
  - 82-001000
  - 82-001018
- Pigott, G. M.
  - 82-000556
- Pihu, E.
  - 82-001238
- Pitchairaj, R.
  - 82-000553
- Pittman, K.
  - 82-000583
- Pitts, P. A.
  - 82-000816
- Platt, T.
  - 82-000587
  - 82-000588
- Platts, W. S.
  - 82-001177
- Plavnik, I.
  - 82-000523
- Plumb, J. A.
  - 82-001047
- Poirier, S. H.
  - 82-001137
- Polgar, T. T.
  - 82-000931
  - 82-001220
- Pollock, B. R.
  - 82-000898
- Ponniah, A. G.
  - 82-000553
- Pontier, P. J.
  - 82-000675
- Porter, R. C.
  - 82-000622
- Post, G.
  - 82-001131
- Pottinger, T. G.
  - 82-000722
- Power, G.
  - 82-000843
  - 82-001161
- Power, M.
  - 82-000887

# AUTHOR INDEX

Poxton, M. G.
82-000541
Poysky, F. T.
82-001043
Prasad, M. S.
82-000733
Prepejchal, W.
82-000737
82-001108
Prewitt, C. G.
82-001273
Prince, E. D.
82-001172
Provancha, M.
82-000982
Purdom, C. E.
82-000782
Quinn, T. P.
82-000827
Rahimov, D. B.
82-001019
Raisanen, G. R.
82-000519
Raknes, A.
82-000977
Ram, N. M.
82-000534
Ramsey, H.
82-001086
Ramsey, J. S.
82-000786
Rand, R. H.
82-000651
Randall, J. E.
82-001020
82-001021
Rapoport, T. A.
82-000690
Rappaport, U.
82-000560
Raschi, W.
82-000623
Rasin, V. J., Jr.
82-001251
Rau, M. E.
82-001070
Reagan, R. E., Jr.
82-000535
Reckahn, J. A.
82-000837
Reed, R. B.
82-001226
Regier, H. A.
82-001161
82-001241
Reichert, W. L.
82-001134
Reisenbichler, R. R.
82-001202
Rettenwander, R.
82-000685
Rey, F.
82-000909
Reynolds, W. W.
82-000799
82-000817
Ribick, M. A.
82-001103
Richard, M.
82-000515
Richkus, W. A.
82-001263
Ricker, W. E.
82-001252
Ridlington, J. W.
82-001135
Rigler, F. H.
82-001164
Rinne, J. N.
82-000899
82-001165
Rinne, W. E.
82-000844
Ripple, K.
82-000933
Risk, M. J.
82-000818
Rivas, L. R.
82-001269
Robbins, W. H.
82-000812
Roberts, R. J.
82-001125
Robertson, D. R.
82-000723
82-000900
Robin, J. H.
82-000546
Robinette, H. R.
82-000557
Robins, C. R.
82-001022
Robison, W. A.
82-001246
Robotham, P. W. J.
82-000932
Roff, J. C.
82-000905
Roitblat, H. L.
82-000819
Rombauts, R.
82-000515
Rosa-Molinar, E.
82-000980
Rosen, M. H.
82-000724
Rosen, R.
82-001067
Rosen, R. A.
82-000845
82-001084
Rosenthal, H.
82-000881
82-000915
Ross, M. A.
82-000784

# AUTHOR INDEX

Ross, M. J.
82-000820
82-001192
Rothbard, S.
82-000536
82-000569
82-000725
Roubal, F. R.
82-001085
Roussel, J. E.
82-001207
Rubec, L. A.
82-001068
Rubitschun, C.
82-000579
Ruggieri, G. D.
82-001064
Ruth, S. B.
82-000980
Ryan, C. J.
82-000589
Ryder, R. A.
82-000779
82-001239
Ryman, N.
82-000508
82-000780
Sakai, D. K.
82-000726
82-000727
Salmenkova, E. A.
82-000762
Salmi, J.
82-000860
Salojarvi, K.
82-001240
Sammarco, P. W.
82-000818
Sandercock, F. K.
82-000520
Sano, N.
82-001219
Santander, G.
82-001063
Sanz, A.
82-000728
Saroglia, M. G.
82-000672
Sartoris, J. J.
82-000576
Sato, A.
82-001146
Sato, M.
82-000756
82-000757
Sato, O.
82-000813
Saunders, R. L.
82-000889
82-001253
Savvaitova, K. A.
82-001015
Scarlett, P. G.
82-001277
Schlesinger, D. A.
82-001241
Schmidt, R. E.
82-000981
Schom, C. B.
82-000994
Schramm, H. L., Jr.
82-001212
Schreck, C. B.
82-000521
82-000736
Schrock, H.
82-000729
Schultz, M. E.
82-001136
Schultz, R. J.
82-001136
Schultze, H.-P.
82-000624
Schurr, K.
82-001115
Schwartz, E.
82-000642
Schwartz, F. J.
82-000982
Schwenzer, D.
82-000509
Scott, A. P.
82-000730
Scott, D. B. C.
82-000888
Scott, J. S.
82-001038
Seigel, J. A.
82-000625
Senanayake, F. R.
82-001166
Sengupta, S.
82-001053
82-001079
Setzler-Hamilton, E. M.
82-000933
Sever, D. M.
82-000974
Shafi, M.
82-000846
Shafland, P. L.
82-000731
Shakour, A. A.
82-000951
Shariff, M.
82-001054
Shaw, E.
82-000797
Shaw, R. F.
82-000983
Shaw, W.
82-000854
Shelldrick, E. L.
82-000730
Shelton, D. W.
82-001145
Shelton, W. L.
82-000572

# AUTHOR INDEX

Shephard, K. L.
82-000732
Sherk, J. A., Jr.
82-001105
Shibata, T.
82-000706
Shimamura, T.
82-001213
Shimizu, M.
82-000872
Shlossman, P. A.
82-000847
Shpigel, M.
82-000821
Shrode, J. B.
82-000822
Shubat, P. J.
82-001137
Shukla, J. P.
82-000814
Sidell, B. D.
82-000694
Simon, R. C.
82-000784
82-001154
Simpson, T. H.
82-000689
Sims, S. E.
82-001227
Sinclair, A.
82-000955
Sinclair, M.
82-000864
82-000955
Singh, B. B.
82-001138
Singh, B. R.
82-000733
Singh, H. R.
82-000903
Singh, R. P.
82-000733
Singh, U. N.
82-000597
Siniff, D. B.
82-000820
Sire, J. Y.
82-000617
Sire, J.-Y.
82-000626
Siskind, B.
82-001107
Sjoblom, V.
82-000855
82-000856
82-000869
82-000870
82-000871
Skelton, P. H.
82-001023
Slinger, S. J.
82-000683
Slooff, W.
82-000734
Smith-Vaniz, W. F.
82-001010
Smith, B. W.
82-001178
Smith, C.
82-001086
Smith, C. E.
82-001081
Smith, G. R.
82-000961
Smith, J. E.
82-001183
Smith, J. F.
82-000638
Smith, R. P.
82-000956
Smithson, T. R.
82-000627
Snelson, F. F., Jr.
82-000848
Snow, J. R.
82-000558
Snyder, D. E.
82-001024
Snyder, W. S.
82-000849
Soebiantoro, B.
82-000559
Soeda, H.
82-001213
Soholt, L. F.
82-001107
Soivio, A.
82-000621
82-000712
82-000735
Solangi, M. A.
82-001055
82-001139
Solbakken, J. E.
82-001140
Solomon, J.
82-000872
Sousa, R. J.
82-001167
Souza, P.
82-000931
Spangler, G. R.
82-000767
82-000775
82-001168
Specker, J. L.
82-000736
Spigarelli, S. A.
82-000737
82-001108
82-001218
Srivastav, S. P.
82-000742
Srivastava, P. N.
82-001109
Stacey, N. E.
82-000738

Stahl, G.
82-000780
Stauffer, J. R., Jr.
82-001096
Stauffer, T. M.
82-000830
Steffensen, J. F.
82-000739
Stenson, J. A. E.
82-000995
Stephens, J. S., Jr.
82-000822
Stephens, R. T. T.
82-000850
Stevenson, D. K.
82-001270
Stickney, R. R.
82-000527
82-000548
82-001215
Stobo, W. T.
82-000895
Stoner, A. W.
82-000934
Strawn, K.
82-001092
Sugiyama, A.
82-001046
Sullivan, J. R.
82-001141
Suminski, R. R.
82-000866
Summers, G. L.
82-000935
Summers, J. K.
82-001263
Sundararaj, B. I.
82-000740
Surat, E. M.
82-000851
Sutterlin, A. M.
82-000889
Sutton, R. J.
82-000537
Suuronen, P.
82-000856
82-000873
Suzuki, M.
82-000741
82-001208
Suzuki, Y.
82-000549
Svetovidov, A. N.
82-001025
Svirsky, A. M.
82-000700
Swanson, R. N.
82-001113
Swarup, K.
82-000742
Swinney, G. N.
82-000781
82-001026
Szelistowski, W. A.
82-000715
Szeto, S. Y.
82-001142
Tabachek, J. L.
82-000554
Taipalinen, I.
82-001106
Takahashi, H.
82-000743
Takama, K.
82-000635
Takeuchi, T.
82-000561
82-000562
82-000563
Takvorian, P. M.
82-001056
Tanaka, K.
82-000629
Tanaka, S.
82-000804
Tarapchak, S. J.
82-000579
Tavolga, W. N.
82-000823
Taylor, A. C.
82-000644
Taylor, K. W.
82-001143
Taylor, M. C.
82-001143
Taylor, W. W.
82-000779
Teranishi, T.
82-000743
Tervet, D. J.
82-001110
Tetens, V.
82-000744
Tham, W.
82-000819
Theofan, G.
82-000745
Thomas, P.
82-001144
Thommes, M. M.
82-000737
82-001108
82-001218
Thompson, D.
82-000782
Thompson, J. S.
82-001087
Thompson, P. C.
82-001184
Thompson, R.
82-000577
Thomson, K. S.
82-000627
Thorpe, J. E.
82-000783
82-000784

## AUTHOR INDEX

Thorson, T. B.
82-000957
Thune, R. L.
82-001047
Tilley, P. A. G.
82-001147
Timmons, T. J.
82-000936
Tjelmeland, S.
82-000909
Todd, T. N.
82-000785
Toivonen, J.
82-001242
Tong, S.
82-000746
Tong, W. C. M.
82-000753
Tongiorgi, P.
82-000815
Topping, G.
82-001097
Townsend, D. W.
82-000984
Townsend, R.
82-001221
Trendall, J. T.
82-001027
Trewavas, E.
82-001028
Tribble, G. W.
82-000890
Tripp, M. R.
82-001036
82-001037
Tsujita, T.
82-000741
Tsukashima, Y.
82-000696
Tubb, R. A.
82-001116
Tulliez, J.
82-001093
Turner, D. T.
82-000566
Turner, P. R.
82-000958
Turner, S. C.
82-001206
Tuurala, H.
82-000621
82-000735
Tyler, A. V.
82-000954
Uchiyama, M.
82-000636
Uehara, R.
82-000563
Uhlig, G.
82-000509
Ulanowicz, R. E.
82-001220
Underwood, H. T.
82-001068
UNESCO
82-001264
Unkenholz, D. G.
82-000845
Utter, F. M.
82-000772
82-001169
Vaillant, C.
82-000686
Valdez, R. A.
82-001029
Valkeajarvi, P.
82-001242
van den Broek, E.
82-001089
Van Dyke, J. M.
82-000884
Van Gorder, S. D.
82-000538
Van Hassel, J.
82-001091
Varanasi, U.
82-001134
Vaughan, T. C.
82-000801
Veen, T. van
82-000628
82-000824
Verhagen, J. H. G.
82-001225
Vetter, R. D.
82-000747
Vigg, S.
82-000852
Villeneuve, D.
82-000991
Vinyard, G. L.
82-000908
82-000923
82-000937
82-000996
Viola, S.
82-000560
Vocke, R. W.
82-001107
von Westernhagen, H.
82-000881
Vondracek, B.
82-000959
Voss, S. D.
82-001145
Wada, M.
82-000561
82-000562
82-000563
Wakabayashi, M.
82-001146
Waldman, B.
82-000825
Walker, A. I.
82-000663
Wallace, R. K., Jr.
82-000786

## AUTHOR INDEX

Walters, C.
82-000784
Wanjala, B.
82-000899
Ward, W. D.
82-001185
Ware, D. M.
82-000853
Warlen, S. M.
82-000960
Warlow, A. D.
82-000938
Warner, R. M.
82-000924
Watabe, N.
82-000629
Watanabe, T.
82-000561
82-000562
82-000563
82-000630
82-000696
Watanabe, Y.
82-000748
82-000749
Watari, H.
82-000611
Waters, T. F.
82-000874
Watson, T. A.
82-001147
Weatherley, A. H.
82-000522
Webb, P. W.
82-000826
82-000939
Webster, D. A.
82-000508
82-001203
Weddle, G. K.
82-000972
Weil, C.
82-000641
Weis, J. S.
82-001148
Weis, P.
82-001148
Weithman, A. S.
82-001186
Weitzman, S. H.
82-000603
Welborn, K. L.
82-000972
Westby, G. W. M.
82-000750
White, F. N.
82-000652
White, P. G.
82-001060
Whitman, R. P.
82-000827
Whitmore, D. H.
82-000787
Whitt, G. S.
82-000778
Wigtil, G. W.
82-001260
Wilde, G. R.
82-001030
Wildish, D. J.
82-001149
Wildrick, D. M.
82-001012
Wiley, M. L.
82-000793
Williams, C. D.
82-000985
82-000986
Williams, J. E.
82-000985
82-000986
Williams, J. G.
82-000788
Williams, R.
82-001233
Williamson, N. J.
82-001274
Willis, D. W.
82-000564
Wilson, J.
82-001221
Wilson, J. L.
82-000956
Wilson, T. C.
82-001193
Windell, J. T.
82-000544
Wisely, B.
82-000573
Wissing, T. E.
82-001111
Withler, F. C.
82-000574
Witte-Maas, E. L. M.
82-000940
Wittenberg, D. K.
82-000751
82-000752
Wittenberg, J. B.
82-000751
82-000752
Wittenberg, W.
82-000751
82-000752
Wohlfarth, G.
82-000528
Wohlschlag, D. E.
82-000647
Wolf, P.
82-000947
Wolters, W. R.
82-000789
82-000790
Woo, N. Y. S.
82-000753
Wood, A. B.
82-001102

Wood, C. M.
82-000754
Wood, K. V.
82-001105
Woodhead, A. D.
82-001088
Wooten, M. C.
82-001122
Worgan, J. P.
82-000941
Wright, D. G.
82-001179
Wright, D. I.
82-000942
Wright, G. L.
82-001260
Wright, J.
82-000764
Wright, R. G.
82-000699
Wright, R. S.
82-000689
Wynes, D. L.
82-001111
Yabe, M.
82-001031
Yamada, J.
82-000629
Yamaguchi, Y.
82-001271
Yancey, P. H.
82-000634
Yoakim, E. G.
82-000631
Yoder, C. O.
82-001112
Yone, Y.
82-000696
Yonemori, T.
82-000828
82-000829
Yoon, T.-H.
82-000755
Yoshida, H.
82-000755
Yoshida, T.
82-001146
Yoshinaka, R.
82-000756
82-000757
Yoshiyama, R. M.
82-000943
Youger, J. D.
82-000578
Young, G.
82-000619
Youngs, W. D.
82-001243
Youngson, A. F.
82-000891
Youson, J. H.
82-000594
82-000758

...CONTINUED...

Youson, J. H.

82-000759
Yurkowski, M.
82-000554
Zadunaisky, J. A.
82-000660
Zakitis, L. H.
82-001150
Zama, K.
82-000635
Zamora, S.
82-000728
Zaugg, W. S.
82-000760
Zerba, K. E.
82-000822
Zietse, M. A.
82-001089
Zimmerman, E. G.
82-000798
Zur, O.
82-000534
Zylberberg, L.
82-000632
82-000633

## GEOGRAPHICAL INDEX

Africa: Lake Victoria
82-000840
82-000899
Alabama
82-000980
82-001226
Alabama: Apalachicola Drainage
82-000786
Alabama: Lewis Smith Reservoir
82-001178
Alabama: West Point Reservoir
82-000936
Alaska
82-000516
82-000517
82-000948
Alaska: Karluk
82-000928
Alaska: Toolik Lake
82-000867
Antarctic Peninsula
82-000964
Arizona
82-000882
82-001158
82-001162
Arizona: Virgin River
82-000988
Arkansas
82-000507
82-000976
82-001181
82-001187
Asia, Southeastern
82-000513
Atlantic Ocean
82-000623
82-001006
82-001266
Atlantic Ocean, North
82-000781
82-000855
82-000856
82-000860
82-000864
82-000869
82-000871
82-000873
82-000895
82-000896
82-000955
82-000977
82-000982
82-001038
82-001052
Atlantic Ocean, North: Middle Atlantic Bight
82-000894
Atlantic Ocean, North: Saint Paul's Rocks
82-000965
Atlantic Ocean, South
82-000998
Australia
82-001078
Australia: Moreton Bay
82-000898
Australia: New South Wales
82-000930
82-001085
Bahama Islands
82-000816
Baltic Sea
82-000870
82-000929
Banda Sea
82-001018
Barents Sea
82-000977
82-001015
Belize
82-001012
Botswana
82-001102
82-001125
California
82-000822
82-000943
82-001244
82-001245
California: Death Valley
82-001030
California: El Capitan Reservoir
82-001175
California: Fresno Cty.: Dinkey Creek
82-001247
California: Imperial Cty.: Senator Wash Reservoir
82-000842
California: Millerton Lake
82-000886
California: Monterey Bay: Elkhorn Slough
82-001261
California: Orange Cty.
82-001050
Canada
82-000843
82-001183
Canada, Western
82-001184
Canada: Baffin Bay
82-000588
Canada: Bay of Fundy
82-000585
Canada: British Columbia
82-000854
82-000993
82-001248
82-001252
Canada: British Columbia: Fraser River Estuary
82-000839
Canada: British Columbia: Marion Lake
82-000917
Canada: Maritime Provinces
82-001253
Canada: Newfoundland
82-000962

# GEOGRAPHICAL INDEX

...CONTINUED...
Canada: Newfoundland
  82-001057
  82-001066
Canada: Northwest Territories
  82-001179
Canada: Nova Scotia: Scotian Shelf
  82-000695
  82-001038
Canada: Nova Scotia: Sheet Harbor
  82-000875
Canada: Ontario
  82-001194
  82-001199
Canada: Quebec
  82-000991
Canada: Quebec: lac Saint-Louis
  82-001077
Canada: Quebec: Riviere aux Pins
  82-000862
  82-000950
Canada: Saskatchewan
  82-001101
Canada: Yukon
  82-000575
Caspian Sea
  82-001019
Central America
  82-001013
China
  82-000530
Colorado River
  82-001249
Colorado: Colorado River System
  82-001024
Colorado: White River
  82-001273
Colorado: Yampa River
  82-001273
Columbia River
  82-000827
  82-001170
Costa Rica
  82-000957
  82-001270
Delaware
  82-001182
Denmark
  82-000966
District of Columbia: Potomac River
  82-001251
El Salvador: Jiquilisco Bay
  82-000979
England
  82-000783
  82-000997
England: Dorset: River Frome
  82-000926
England: Rutland Water
  82-000584
  82-000938
  82-001083
  82-001200
England: Windermere
  82-001228
Finland
  82-000855
  82-000856
  82-000860
  82-000869
  82-000871
  82-000873
  82-001087
  82-001240
Finland: Lake Konnevesi
  82-001242
Finland: Lake Paijanne
  82-000902
Florida
  82-000731
  82-000892
  82-000904
  82-001235
Florida: India River Lagoon
  82-000848
France
  82-000648
Georgia: West Point Reservoir
  82-000581
  82-000936
Great Lakes
  82-000785
  82-000830
  82-000837
  82-000863
  82-000961
  82-001229
  82-001231
  82-001236
Guam
  82-000992
Gulf of Mexico
  82-000859
Hawaii
  82-000614
Illinois: Pulaski Cty.: Mill Creek
  82-000832
India: Garhwal
  82-000903
Indian Ocean
  82-001001
Indiana: Monroe Reservoir
  82-000944
Indiana: St. Joseph River
  82-000974
Inidana: Posey Cty.
  82-000972
Iowa
  82-001051
Iran
  82-001003
Iraq: Habbaniyah Reservoir
  82-000846
Ireland
  82-000783
Israel
  82-000534
Israel: Lake Kinneret
  82-000908

## GEOGRAPHICAL INDEX

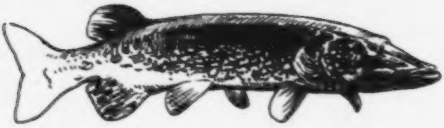
- Japan
  - 82-000510
  - 82-000921
- Japan: Hokkaido: Lake Notoro
  - 82-000838
- Japan: Lake Kasumigaura
  - 82-001224
- Japan: Miyake-jima
  - 82-000890
- Japan: Odawa Bay
  - 82-000804
- Japan: Shin Tone River
  - 82-000872
- Kansas
  - 82-000624
  - 82-000770
  - 82-000975
- Kentucky
  - 82-001246
- Kenya
  - 82-001216
- Lake Erie
  - 82-000922
- Lake Huron
  - 82-000767
- Lake Malawi
  - 82-000840
- Lake Michigan
  - 82-000579
  - 82-000777
  - 82-001108
  - 82-001218
  - 82-001230
- Lake Superior
  - 82-000769
  - 82-000775
  - 82-001232
- Lake Victoria
  - 82-000840
  - 82-000899
- Louisiana
  - 82-000859
- Louisiana: Barataria Basin
  - 82-001210
- Louisiana: Wilkinson Cty.: Thompson Creek
  - 82-000969
- Maine
  - 82-001221
- Maine: Gulf of Maine
  - 82-000913
- Maine: Sheepscot River Estuary
  - 82-000983
- Maine: Sullivan Harbor
  - 82-000984
- Maryland: Allegany Cty.: Town Creek
  - 82-000967
- Maryland: North Branch Potomac River
  - 82-001096
- Mediterranean Sea
  - 82-000927
- Mexico
  - 82-000582
  - 82-001002
- Mexico, Northwestern
  - 82-001196
- Mexico: Coahuila: Cuatro Cienegas Basin
  - 82-001176
- Mexico: Cuatro Cienegas
  - 82-000612
- Mexico: Vicente Guerrero Reservoir
  - 82-000833
- Minnesota: Valley Creek
  - 82-000874
- Mississippi
  - 82-000535
- Mississippi River
  - 82-001212
- Missouri
  - 82-000976
- Missouri River: Gavins Point Dam
  - 82-000845
- Missouri: Lake Taneycomo
  - 82-001186
- Netherlands Antilles
  - 82-000978
- Nevada
  - 82-000577
  - 82-000959
  - 82-000999
- Nevada: Pyramid Lake
  - 82-000852
  - 82-001233
- Nevada: Railroad Valley
  - 82-000985
- Nevada: Virgin River
  - 82-000844
  - 82-000988
- New England
  - 82-001253
- New Mexico
  - 82-001002
- New Mexico: Bitter Lake Wildl. Refuge
  - 82-000878
- New Mexico: Tularosa Basin
  - 82-000866
- New York: Adirondacks
  - 82-001203
- New Zealand: Lake Waahi
  - 82-000850
- Nicaragua
  - 82-000957
- North America
  - 82-000514
- North Carolina
  - 82-000960
  - 82-000981
  - 82-000982
  - 82-001265
- North Carolina: Eno River
  - 82-000841
- North Carolina: Tar River
  - 82-000841
- North Dakota
  - 82-001034
- Norway
  - 82-000953

# GEOGRAPHICAL INDEX

Ohio
82-000578
82-001112
Ohio: Little Miami River
82-001111
Ohio: Maumee River
82-000849
Ohio: Richland Cty.: Cedar Fork Creek
82-000592
Oklahoma: American Horse Lake
82-000935
Oklahoma: Keystone Reservoir
82-001256
Oklahoma: Okmulgee Cty.: Dripping Springs Lake
82-001260
Oklahoma: Payne Cty.: Boomer Lake
82-000897
Oman
82-000835
Oregon
82-000911
Oregon: Harney Cty.: Borax Lake
82-001151
Oregon: Whitehorse Basin
82-001152
Oregon: Yaquina Bay
82-000792
Pacific Ocean
82-000614
82-000822
82-000854
82-000911
82-000943
82-000993
82-001013
82-001017
82-001078
82-001183
82-001268
Pacific Ocean: Palau
82-000900
Panama
82-000887
Pennsylvania
82-001099
Pennsylvania: Bedford Cty.: Town Creek
82-000967
Potomac River
82-001250
Potomac River Estuary
82-000931
82-000933
82-001220
82-001263
Red Sea
82-000951
82-001020
Scandinavia
82-000780
Scotland: Forth Area
82-000973
South Africa
82-001275
South Africa: Olifants River
82-001023
South America
82-000888
South Carolina
82-000963
South Carolina: Cooper River
82-000949
Spain
82-001009
Spain: Catalan
82-000927
Sri Lanka
82-001166
Tennessee
82-000956
Texas
82-000647
82-001002
82-001254
Texas: Brazos Cty.: Little Brazos River
82-001068
Texas: Galveston
82-000968
Texas: Galveston Bay
82-001092
Texas: Lake Texoma
82-000836
Texas: Salt Creek
82-000878
United Kingdom
82-000781
United States
82-000582
82-000778
82-001043
United States, Southwestern
82-001174
82-001249
United States: Northwestern
82-000986
USSR
82-000762
USSR: Estonia: Lake Vortsjarv
82-001238
Utah
82-000577
82-000906
Utah: Colorado River
82-001029
Utah: Virgin River
82-000844
82-000988
Virginia: Claytor Lake
82-001259
Virginia: Giles Cty.: Big Stony Creek
82-001195
82-001197
82-001201
Virginia: Shenandoah River
82-000971
Wales
82-000901

# GEOGRAPHICAL INDEX

Washington
  82-000993
  82-001185
West Germany: Schleswig-Holstein
  82-000970
West Virginia: North Branch Potomac River
  82-001096
  82-001100
Wyoming
  82-000831
Wyoming: North Platte River
  82-000576



## SYSTEMATIC INDEX

- Abramis brama
  - Hermaphroditism
    - 82-000734
  - Hybridization
    - 82-000781
  - Temperature
    - 82-000700
- Acanthopagrus australis
  - Movements
    - 82-000898
  - Parasites/Diseases
    - 82-001085
- Acheilognathus lanceolatus
  - Pheromones
    - 82-000879
  - Spawning
    - 82-000879
- Aequidens coeruleopunctatus
  - Brooding Behavior
    - 82-000876
  - Spawning
    - 82-000876
- Agosia chrysogaster
  - Spawning
    - 82-000882
- Alopias superciliosus
  - Life History/General
    - 82-000834
  - Taxonomy
    - 82-000834
- Alosa
  - Light
    - 82-000809
  - Phototropism
    - 82-000809
- Alosa pseudoharengus
  - Forage Introductions
    - 82-001259
  - Impingement/Entrainment
    - 82-001218
  - Power Plants
    - 82-001218
- Ambloplites cavifrons
  - Age/Growth
    - 82-000841
  - Foods/Feeding
    - 82-000841
- Ambloplites rupestris
  - Lernaea cruciata
    - 82-001077
  - Parasites/Diseases
    - 82-001077
  - Parasitic Copepods
    - 82-001077
- Ameiurus nebulosus
  - Digestive System
    - 82-000714
  - Reproductive System
    - 82-000714
- Amia calva
  - Embryology
    - 82-000613
- Amphipnous cuchia
  - Solar Eclipses
    - 82-000814
- Amphiprion percula
  - Predator/Prey Relationships
    - 82-000939
- Anabas testudineus
  - Solar Eclipses
    - 82-000814
- Anchoa mitchilli
  - Impingement/Entrainment
    - 82-001092
  - Power Plants
    - 82-001092
  - Thermal Pollution
    - 82-001092
- Ancistrus chagresi
  - Air Breathing
    - 82-000671
- Anguilla
  - Cardio-Vascular System
    - 82-000656
  - Catecholamines
    - 82-000656
  - Immune Response
    - 82-001053
  - Myxobolus
    - 82-001053
  - Parasites/Diseases
    - 82-001053
  - Protozoan Diseases
    - 82-001053
- Anguilla anguilla
  - Activity Patterns
    - 82-000824
  - Age/Growth
    - 82-000648
  - Cauliflower Disease
    - 82-001035
  - Culture/Propagation
    - 82-000529
  - Fish Grading
    - 82-000529
  - Light
    - 82-000824
  - Metamorphosis
    - 82-000648
  - Musculature
    - 82-000600
  - Olfaction
    - 82-000815
  - Parasites/Diseases
    - 82-001035
  - Pineal Body
    - 82-000628
- Anguilla australis schmidtii
  - Parasites/Diseases
    - 82-001079
  - Telogaster opisthorchis
    - 82-001079
  - Trematodes
    - 82-001079
- Anguilla rostrata
  - Age/Growth
    - 82-000949
  - Oil
    - 82-001129

## SYSTEMATIC INDEX

...CONTINUED...
Anguilla rostrata
  Sex Ratios
    82-000949
Anoplarchus purpurescens
  Foods/Feeding
    82-000943
Anoplarchus purpurescens purpurescens
  Habitat Selection
    82-000792
Anoplopoma fimbria
  Age/Growth
    82-000945
Aphanius dispar
  Life History/General
    82-000835
Aplocheilus lineatus
  Acoustico-Lateralis System
    82-000642
  Foods/Feeding
    82-000918
    82-000919
  Predator/Prey Relationships
    82-000919
Aplodinotus grunniens
  Age/Growth
    82-000849
    82-000952
  Distribution/Geographical
    82-000975
  Mortality Rates
    82-000849
  Transportation
    82-000567
Archoplites interruptus
  Foods/Feeding
    82-000996
  Life History/General
    82-000852
  Predator/Prey Relationships
    82-000996
Aristichthys nobilis
  Culture/Propagation
    82-000536
    82-000574
  Gamete Storage
    82-000574
  Induced Maturation
    82-000536
Arius felis
  Auditory Senses
    82-000823
Aspius vorax
  Life History/General
    82-000846
Astronotus ocellatus
  Temperature
    82-000731
Austrophycis
  Taxonomy
    82-001025
Belonesox belizanus
  Temperature
    82-000731
Benthophilus ctenolepidus pinchuki
  New Subspecies
    82-001019
Benthophilus nagistri lencorancius
  New Subspecies
    82-001019
Benthosema glaciale
  Meristic Studies
    82-000591
  Variation Studies
    82-000591
Betta splendens
  Learning
    82-000819
  Memory
    82-000819
Bhanotia fasciolata
  Taxonomy
    82-001007
Blicca bjoerkna
  Hybridization
    82-000781
Boleophthalmus boddarti
  Territorial Behavior
    82-000801
Brachydanio
  Enzymes
    82-000675
Brachydanio rerio
  Alarm Reaction
    82-000825
  Embryology
    82-000597
    82-000676
  Vision
    82-000596
    82-000800
Branchiostegidae
  Musculature
    82-001014
  Taxonomy
    82-001014
Brevoortia patronus
  Abundance
    82-000859
  Commercial Fishing
    82-000859
  Population Studies
    82-000859
Brevoortia tyrannus
  Acoustico-Lateralis System
    82-000610
  Culture/Propagation
    82-000540
  Digestion Rates
    82-000664
  Excretory System
    82-000664
  Holding Facilities
    82-000540
  Research Test Fish
    82-000540
  Swimbladder
    82-000610

## SYSTEMATIC INDEX

Calamoichthys
Taxonomy
82-001026
Callionymus
Taxonomy
82-001011
Carassius auratus
ATP
82-000687
Auditory Senses
82-000666
Blood Chemistry
82-000687
82-000727
Culture/Propagation
82-000566
Distribution/Geographical
82-000981
Enzymes
82-000724
Immune Response
82-000724
Light
82-000704
Osmoregulation
82-000687
Pineal Body
82-000704
Scales
82-000632
82-000633
Transportation
82-000566
Carcharhinus
Distribution/Geographical
82-000965
Population Studies
82-000965
Carcharhinus leucas
Age/Growth
82-000957
Cleaning Behavior
82-000807
Life History/General
82-000848
Carcharhinus signatus
Dentition
82-000623
Taxonomy
82-000623
Catostomus commersoni
Nematodes
82-001082
Parasites/Diseases
82-001082
Catostomus tahoensis
Age/Growth
82-000959
Foods/Feeding
82-000959
Catostomus warnerensis
Status
82-000858
Catostonus commersoni
Age/Growth
82-000952
Caulophrynidae
Distribution/Geographical
82-001018
Taxonomy
82-001018
Cepola rubescens
Blood Chemistry
82-000644
Respiration
82-000644
Chaetodon
Competition
82-000816
Habitat Selection
82-000816
Channa punctatus
Air Breathing
82-000733
Reproductive System
82-000707
Respiration
82-000733
Chelon labrosus
Foods/Feeding/Selectivity
82-000912
Chondrichthyes
Life History/General
82-001269
Management/Research--Marine
82-001269
Chromis enchrysura
Taxonomy
82-001010
Variation Studies
82-001010
Chromis punctipinnis
Temperature
82-000822
Temperature Selection
82-000822
Chrysophrys auratus
Parasites/Diseases
82-001032
Chrysophrys major
Culture/Propagation
82-000549
Feeding Experiments
82-000549
Feeds
82-000549
Cichlasoma bimaculatum
Temperature
82-000731
Cichlasoma cyanoguttatum
Temperature
82-000731
Cichlasoma meeki
Temperature
82-000731
Cichlasoma octofasciatum
Temperature
82-000731

- Cichlasoma trimaculatum
  - Temperature
    - 82-000731
- Cichlidae
  - Chemoreceptism
    - 82-000791
  - Variation Studies
    - 82-000612
- Clarias batrachus
  - Calcium
    - 82-000742
  - Gas Bubble Disease
    - 82-001075
  - Parasites/Disease
    - 82-001075
  - Temperature
    - 82-000731
  - Vitamins
    - 82-000742
- Clarias lazera
  - Culture/Propagation
    - 82-000533
  - Feeding Experiments
    - 82-000533
  - Fingerling Production
    - 82-000533
- Clupea harengus
  - Age/Growth
    - 82-000860
  - Healing
    - 82-000681
  - Mortality Rates
    - 82-000860
    - 82-000869
  - Population Studies
    - 82-000856
    - 82-000860
    - 82-000869
    - 82-000871
  - Production
    - 82-000869
  - Recruitment
    - 82-000871
- Clupea harengus harengus
  - Abundance/Factors of
    - 82-000864
  - Age/Growth
    - 82-000955
  - Fish Stocks
    - 82-000864
  - Maturation
    - 82-000955
  - Population Studies
    - 82-000864
- Clupea harengus pallasi
  - Abundance/Factors of
    - 82-000881
  - Cannibalism
    - 82-000915
  - Fecundity
    - 82-000838
  - Foods/Feeding
    - 82-000838

...CONTINUED...

- Clupea harengus pallasi
  - Foods/Feeding
    - 82-000915
  - Marking/Tagging
    - 82-001189
  - Spawning
    - 82-000838
    - 82-000881
  - Spawning Substrates
    - 82-000881
- Clupeidae
  - Digestive System
    - 82-000703
  - Enzymes
    - 82-000703
- Cobitis taenia
  - Foods/Feeding
    - 82-000932
  - Mouth Parts
    - 82-000932
- Colisa fasciata
  - Solar Eclipses
    - 82-000814
- Compostoma anomalum
  - Acid Mine Water
    - 82-001099
- Coregoninae
  - Electrophoresis
    - 82-000785
  - Speciation
    - 82-000785
  - Variation Studies
    - 82-000785
- Coregonus clupeaformis
  - Cestodes
    - 82-001067
  - Culture/Propagation
    - 82-000519
  - Electrophoresis
    - 82-000837
  - Exploitation Rates
    - 82-000865
  - Fingerling Production
    - 82-000519
  - Fish Stocks
    - 82-000615
    - 82-000767
    - 82-000837
  - Life History/General
    - 82-000837
  - Meristic Studies
    - 82-000615
  - Parasites/Diseases
    - 82-001067
  - Population Studies
    - 82-000767
    - 82-000865
  - Recruitment
    - 82-000865
  - Spawning
    - 82-000865
  - Triaenophorus crassus
    - 82-001067
  - Variation Studies
    - 82-000767

...CONTINUED...

- Coregonus clupeaformis
  - Variation Studies
    - 82-000837
- Coregonus pollan
  - Biochemical Composition
    - 82-000655
  - Enzymes
    - 82-000654
  - Starvation
    - 82-000654
- Coris dorsomaculata
  - Spawning
    - 82-000890
- Coryphopterus personatus
  - Hermaphroditism
    - 82-000723
- Cottus beldingi
  - Foods/Feeding
    - 82-000923
  - Predator/Prey Relationships
    - 82-000923
- Cottus cognatus
  - Habitat Selection
    - 82-000867
  - Population Studies
    - 82-000867
  - Production
    - 82-000867
- Crystallodytes cookei
  - Early Development
    - 82-000614
  - Embryology
    - 82-000614
  - Movements
    - 82-000614
- Ctenopharyngodon idella
  - Cage Culture
    - 82-000525
  - Culture/Propagation
    - 82-000525
    - 82-000536
  - Culture/Propagaton
    - 82-000574
  - Gamete Storage
    - 82-000574
  - Induced Maturation
    - 82-000536
  - Spawning
    - 82-000884
- Culaea inconstans
  - Air Breathing
    - 82-000697
  - Apatemon gracilis
    - 82-001070
  - Parasites/Diseases
    - 82-001070
  - Respiration
    - 82-000697
  - Trematodes
    - 82-001070
- Cydothone parapallida
  - New Species
    - 82-000998
- Cymatogaster aggregata
  - Temperature
    - 82-000822
  - Temperature Selection
    - 82-000822
- Cynoscion arenarius
  - Metabolic Rates
    - 82-000747
  - Movements
    - 82-000847
  - Population Studies
    - 82-000847
  - Spawning
    - 82-000847
  - Temperature
    - 82-000747
- Cynoscion nebulosus
  - Metabolic Rates
    - 82-000747
  - Temperature
    - 82-000747
- Cypriniformes
  - Identification/Larvae
    - 82-001024
  - Morphology
    - 82-001024
- Cyprinodon
  - Electrophoresis
    - 82-000788
  - Salinity
    - 82-001030
  - Sexual Dimorphism
    - 82-000608
  - Taxonomy
    - 82-001030
  - Temperature
    - 82-001030
  - Variation Studies
    - 82-000788
- Cyprinodon pecosensis
  - Maturation
    - 82-000878
  - Spawning
    - 82-000878
    - 82-000883
- Cyprinodon salinus
  - Salinity
    - 82-000637
- Cyprinodon tularosa
  - Age/Growth
    - 82-000866
  - Fecundity
    - 82-000866
  - Life History/General
    - 82-000866
  - Population Studies
    - 82-000866
  - Production
    - 82-000866
- Cyprin[illegible]on variegatus
  - Digestive System
    - 82-000622
- Cyprinus carpio
  - Age/Growth
    - 82-000528

...CONTINUED...
Cyprinus carpio
ATP
82-000635
Biomagnification
82-001146
Blood Chemistry
82-000691
82-000692
Cadmium
82-001128
Chromium
82-001127
Complexing Agents
82-001128
Culture/Propagation
82-000526
82-000528
82-000531
82-000532
82-000536
82-000542
82-000555
82-000560
82-000562
82-000574
Endocrinology
82-000690
Excretory System
82-000630
Feeding Experiments
82-000542
82-000555
82-000560
82-000562
Feeds
82-000542
82-000555
82-000560
Gamete Storage
82-000574
Gas Bubble Disease
82-000672
Gas Supersaturation
82-000672
Genetic Strains
82-000528
Growth Stimulants
82-000531
Heated Water
82-000542
Heavy Metals
82-001127
82-001128
Hormones
82-000526
82-000531
Induced Maturation
82-000526
82-000536
Lipid Metabolism
82-000562
Nutrition
82-000562

...CONTINUED...
Cyprinus carpio
Osmoregulation
82-000674
82-000678
Parasites/Diseases
82-000672
Polyploidy
82-000532
Pond Culture
82-000528
Scales
82-000633
Steroids
82-000526
Surfactants
82-001146
Cytarichthys gilberti
Nerocilia californica
82-001062
Parasites/Diseases
82-001062
Parasitic Isopods
82-001062
Dactyloscopidae
Fish Lists/Keys
82-001006
Taxonomy
82-001006
Dascyllus aruanus
Coexistance
82-000821
Dascyllus marginatus
Coexistance
82-000821
Dicentrarchus labrax
Culture/Propagation
82-000546
Feeding Experiments
82-000546
Feeds
82-000546
Diplophos
Musculature
82-000603
Skeletal System
82-000603
Taxonomy
82-000603
Dipnoa
Dentition
82-000624
Paleontology
82-000624
Ditrema temmincki
Competition
82-000804
Habitat Selection
82-000804
Ditrema viridis
Competition
82-000804
Habitat Selection
82-000804

Dorosama cepedianum
  Foods/Feeding
    82-000907
Dorosoma petenense
  Forage Introductions
    82-001175
  Management/Research--Reservoirs
    82-001175
  Stocking/Introductions
    82-001175
Elasmobranchii
  Age/Growth
    82-000947
Embiotoca jacksoni
  Temperature
    82-000822
  Temperature Selection
    82-000822
Enchelybrotula
  Distribution/Geographical
    82-001004
  Taxonomy
    82-001004
Engraulis mordax
  Age/Growth
    82-000868
  Mortality Rates
    82-000868
  Predator/Prey Relationships
    82-000939
  Starvation
    82-000716
  Year Class Strength
    82-000868
Epibulus insidiator
  Movements
    82-000900
Erpetoichthys
  Taxonomy
    82-001026
Esox lucius
  Abundance/Factors of
    82-000991
  Black-Spot Disease
    82-001071
  Distribution/Seasonal
    82-000893
  Foods/Feeding
    82-000926
  Metabolic Rates
    82-000659
  Parasites/Diseases
    82-001071
    82-001087
  Spawning
    82-000991
  Temperature Selection
    82-000893
  Thermal Pollution
    82-000893
  Trematodes
    82-001071

...CONTINUED...
Esox lucius
  Tumors
    82-001087
  Year Class Strength
    82-000991
Esox masquinongy
  Distribution/Seasonal
    82-000893
  Temperature Selection
    82-000893
  Thermal Pollution
    82-000893
Etheostoma chlororbranchium
  Distribution/Geographical
    82-000981
Etheostoma cragini
  Habitat Selection
    82-000975
Etheostomatini
  Electrophoresis
    82-000765
Eusthenopteron foordi
  Auditory Senses
    82-000627
Fundulus grandis
  Eimeria funduli
    82-001055
  Parasites/Diseases
    82-001055
  Protozoan Diseases
    82-001055
Fundulus heteroclitus
  Aroclor
    82-001148
  Endocrinology
    82-000636
  Immune Response
    82-001036
    82-001037
  Insecticides
    82-001148
  Malate Dehydrogenase
    82-000766
  Osmoregulation
    82-000636
  Otoliths
    82-000629
  Parasites/Diseases
    82-001036
    82-001037
  Polychlorinated Biphenyls
    82-001148
Gadidae
  Enzymes
    82-000706
Gadus morhua
  Distribution/Geographical
    82-000977
  Population Studies
    82-000855
    82-000873
Gambusia
  Distribution/Geographical
    82-001012

...CONTINUED...
Gambusia
  Taxonomy
    82-001012
Gambusia affinis
  Glugea
    82-001050
  Parasites/Diseases
    82-001050
  Protozoan Diseases
    82-001050
  Vision
    82-000699
Gasterosteus aculeatus
  Activity Patterns
    82-000941
  Bird Predation
    82-000990
  Competition
    82-000990
  Foods/Feeding
    82-000941
  Predator/Prey Relationships
    82-000990
Gasterosteus wheatlandi
  Activity Patterns
    82-000941
  Foods/Feeding
    82-000941
Gephyroglanis barnardi
  New Species
    82-001023
Gigantactinidae
  Distribution/Geographical
    82-001000
  Taxonomy
    82-001000
Gila
  Distribution/Geographical
    82-000986
  Status
    82-000986
Gila bicolor mohavensis
  Habitat Alterations
    82-001173
  Status
    82-001173
Gila boraxobius
  Status
    82-001151
Gila cypha
  Distribution/Geographical
    82-001029
  Taxonomy
    82-001029
Gillichthys mirabilis
  ATP
    82-000662
  Osmoregulation
    82-000662
Glyptothorax pectinopterum
  Foods/Feeding
    82-000903
Gobiomorphus cotidianus
  Age/Growth
    82-000850

...CONTINUED...
Gobiomorphus cotidianus
  Mortality Rates
    82-000850
  Spawning
    82-000850
Gobiosoma illecebrosum
  Hermaphroditism
    82-000723
Gobiosoma multifasciatum
  Hermaphroditism
    82-000723
Gobiosoma saucrum
  Hermaphroditism
    82-000723
Haemulon sciurus
  Oil
    82-001140
  Phenanthrene
    82-001140
Haemulopsis
  Taxonomy
    82-001013
Haplochromis
  Life History/General
    82-000840
Haplochromis barbarae
  Foods/Feeding
    82-000940
Haplochromis elegans
  Vision
    82-000620
Hemichromis bimaculatus
  Scales
    82-000626
  Temperature
    82-000731
Hemiglyphidodon plagiometopon
  Territorial Behavior
    82-000818
Hemitripterus americanus
  Temperature
    82-000817
  Temperature Selection
    82-000817
Heteropneustes fossilis
  Blood Chemistry
    82-001109
  Culture/Propagation
    82-000553
  Digestive System
    82-000670
  Endocrinology
    82-000740
  Feeding Experiments
    82-000553
  Gas Bubble Disease
    82-001075
  Hormones
    82-000740
  Insecticides
    82-001109
    82-001138
  Parasites/Disease
    82-001075

...CONTINUED...
- Heteropneustes fossilis
  - Reproduction
    - 82-000740
  - Sewage Effluents
    - 82-001109
  - Thiodan
    - 82-001138
  - Vitellogenin
    - 82-000740
- Hypophthalmichthys molitrix
  - Culture/Propagation
    - 82-000536
  - Induced Maturation
    - 82-000536
- Hypoprion bigelowi
  - Dentition
    - 82-000623
  - Taxonomy
    - 82-000623
- Hypostomus
  - Temperature
    - 82-000731
- Hypostomus plecostomus
  - Air Breathing
    - 82-000671
- Hypsurus caryi
  - Temperature Selection
    - 82-000822
- Icelidae
  - Skeletal System
    - 82-001031
  - Taxonomy
    - 82-001031
- Ichthyomyzon unicuspis
  - Locomotion
    - 82-000651
  - Nervous System
    - 82-000651
- Ictaluridae
  - Life History/General
    - 82-000833
- Ictalurus brunneus
  - Karyotypes
    - 82-001005
  - Variation Studies
    - 82-001005
- Ictalurus hazenensis
  - New Species
    - 82-000999
  - Paleontology
    - 82-000999
- Ictalurus melas
  - Gas Bubble Disease
    - 82-000672
  - Gas Supersaturation
    - 82-000672
  - Parasites/Diseases
    - 82-000672
- Ictalurus nebulosus
  - Age/Growth
    - 82-000950
  - Electroreception
    - 82-000746

...CONTINUED...
- Ictalurus nebulosus
  - Foods/Feeding
    - 82-000920
- Ictalurus platycephalus
  - Karyotypes
    - 82-001005
  - Variation Studies
    - 82-001005
- Ictalurus punctatus
  - Aeromonas hydrophila
    - 82-001047
  - Alarm Cells
    - 82-000631
  - Bacterial Diseases
    - 82-001047
  - Biofiltration
    - 82-000537
  - Blood
    - 82-000789
  - Cage Culture
    - 82-000524
  - Culture/Propagation
    - 82-000524
    - 82-000535
    - 82-000537
    - 82-000538
    - 82-000548
    - 82-000555
    - 82-000557
  - Diets
    - 82-000557
  - Feeding Experiments
    - 82-000548
    - 82-000555
  - Feeds
    - 82-000555
    - 82-000557
  - Filtration Systems
    - 82-000538
  - Hydroponics
    - 82-000537
  - Immunization
    - 82-001047
  - Parasites/Diseases
    - 82-001047
    - 82-001068
  - Polyploidy
    - 82-000789
  - Population Studies
    - 82-000862
  - Recirculating System
    - 82-000538
  - Selective Breeding
    - 82-000524
  - Spawning
    - 82-000862
  - Trematodes
    - 82-001068
  - Triploid Fish
    - 82-000789
    - 82-000790
- Ictiobus cyprinellus
  - Tuberculation
    - 82-000618

## SYSTEMATIC INDEX

Iotichthys phlegethontis
Foods/Feeding
82-000906
Habitat Selection
82-000906
Iranocichla hormuzensis
New Species
82-001003
Labeo rohita
Culture/Propagation
82-000574
Gamete Storage
82-000574
Labroides dimidiatus
Cleaning Behavior
82-000807
Lagodon rhomboides
Foods/Feeding
82-000934
Predator/Prey Relationships
82-000934
Lampetra planeri
Foods/Feeding
82-000925
Leiognathidae
Fins
82-000625
Skeletal System
82-000625
Lepidomeda mollispinis
Life History/General
82-000844
Lepisosteus osseus
Embryology
82-000613
Lepisosteus platyrhynchus
Corpuscle of Stannius
82-000594
Lepomis cyanellus x L. microlophus
Hybridization
82-001255
Management/Research--Ponds
82-001255
Lepomis gibbosus
Myxobolus osburni
82-001051
Parasites/Diseases
82-001051
Protozoan Diseases
82-001051
Lepomis macrochirus
Aeration
82-001175
Age/Growth
82-001175
Black Spot Disease
82-001076
Forage Introductions
82-001175
Heavy Metals
82-001118
Management/Research--Reservoirs
82-001175

...CONTINUED...
Lepomis macrochirus
Mercury
82-001118
Nematodes
82-001074
Nitrite
82-001122
Parasites/Diseases
82-001074
82-001076
Spinitectus carolini
82-001074
Trematodes
82-001076
Uvulifer ambloplitis
82-001076
Lepomis microlophus x L. cyanellus
Hybridization
82-001255
Management/Research--Ponds
82-001255
Leptocottus armatus
Oil Refinery Effluents
82-001135
Lethrinus mahsena
Age/Growth
82-000951
Condition Factors
82-000951
Lethrinus xanthochilus
Age/Growth
82-000951
Condition Factors
82-000951
Leuroglossus schmidti
Taxonomy
82-001017
Leuroglossus stilbius
Taxonomy
82-001017
Limnichthys donaldsoni
Early Development
82-000614
Embryology
82-000614
Movements
82-000614
Liza aurata
Foods/Feeding/Selectivity
82-000912
Liza ramada
Foods/Feeding/Selectivity
82-000912
Lopholatilus chamaeleonticeps
Longlines
82-001206
Loricaria uracantha
Spawning
82-000887
Lutjanidae
Fish Lists/Keys
82-000978
Macrouridae
Swimbladder
82-000595

- Mallotus villosus
  - Foods/Feeding
    - 82-000909
- Mallotus villosus villosus
  - Reproductive System
    - 82-000605
- Melanogrammus aeglefinus
  - Coloration
    - 82-000604
  - Parasites/Diseases
    - 82-001038
- Menidia beryllina
  - Life History/General
    - 82-000836
  - Oil
    - 82-001139
  - Population Studies
    - 82-000836
- Merluccius gayi
  - Anisakis
    - 82-001063
  - Nematodes
    - 82-001063
  - Parasites/Diseases
    - 82-001063
- Microdesmus longipinnis
  - Distribution/Geographical
    - 82-000980
- Microgadus tomcod
  - Antifreeze Production
    - 82-000667
- Microgeophagus
  - Taxonomy
    - 82-001022
- Micrometrus minimus
  - Temperature
    - 82-000822
  - Temperature Selection
    - 82-000822
- Micropogonias undulatus
  - Age/Growth
    - 82-000960
  - Spawning
    - 82-000960
- Micropterus
  - Hybridization
    - 82-000787
- Micropterus dolomieui
  - Activity Patterns
    - 82-000812
  - Culture/Propagation
    - 82-000564
  - Diets
    - 82-000564
  - Feeds
    - 82-000564
  - Habitat Selection
    - 82-000812
- Micropterus salmoides
  - Aeration
    - 82-001175
  - Age/Growth
    - 82-001175

...CONTINUED...

- Micropterus salmoides
  - Culture/Propagation
    - 82-000543
  - Diets
    - 82-000543
  - Exploitation Rates
    - 82-001226
  - Feeds
    - 82-000543
  - Foods/Feeding
    - 82-000916
    - 82-000935
  - Foods/Feeding/Selectivity
    - 82-000936
  - Forage Introductions
    - 82-001175
  - Genetic Strains
    - 82-000778
  - Management/Research--Reservoirs
    - 82-001175
  - Myxobilatus mictospora
    - 82-001049
  - Parasites/Diseases
    - 82-001049
  - Predator/Prey Relationships
    - 82-000916
    - 82-000936
  - Protozoan Diseases
    - 82-001049
  - Spawning
    - 82-000886
  - Temperature
    - 82-000652
  - Temperature Selection
    - 82-000652
  - Variation Studies
    - 82-000778
  - Water Level Fluctuations
    - 82-000886
- Micropterus salmoides floridanus
  - Age/Growth
    - 82-000956
  - Age/Grwoth
    - 82-001260
  - Catchability
    - 82-001260
  - Management/Research--Reservoirs
    - 82-001260
  - Mortality Rates
    - 82-001260
  - Movements
    - 82-000897
  - Power Plant Effluents
    - 82-000897
  - Temperature
    - 82-000649
    - 82-000897
  - Thermal Pollution
    - 82-000897
  - Thermal Shock
    - 82-000649
- Micropterus salmoides salmoides
  - Age/Growth
    - 82-000956

...CONTINUED...
Micropterus salmoides salmoides
  Age/Growth
    82-001260
  Catchability
    82-001260
  Management/Research--Reservoirs
    82-001260
  Mortality Rates
    82-001260
  Movements
    82-000897
  Power Plant Effluents
    82-000897
  Temperature
    82-000649
    82-000897
  Thermal Pollution
    82-000897
  Thermal Shock
    82-000649
Microstomus pacificus
  Age/Growth
    82-000954
  Foods/Feeding/Selectivity
    82-000911
  Upwelling
    82-000954
Mirolabrichthys
  Taxonomy
    82-001021
Misgurnus anguillicaudatus
  Foods/Feeding/Selectivity
    82-000914
  Reproduction
    82-000743
  Vitellogenin
    82-000743
Moridae
  Swimbladder
    82-000595
  Taxonomy
    82-001025
Morone americana
  Foods/Feeding
    82-000933
  Harvest
    82-001263
  Management/Research--Estuaries
    82-001263
  Production
    82-001263
Morone mississippiensis
  Age/Growth
    82-000944
  Management/Research--Reservoirs
    82-000944
  Population Studies
    82-000944
Morone saxatilis
  Bioenergetics
    82-000694
  Culture/Propagation
    82-000558

...CONTINUED...
Morone saxatilis
  Culture/Propagation
    82-000559
  Diets
    82-000558
  Feeding Experiments
    82-000558
    82-000559
  Feeds
    82-000558
    82-000559
  Foods/Feeding
    82-000931
    82-000933
  Management/Research--Reservoirs
    82-001256
  Pollution
    82-001103
  Skeletal System
    82-001103
  Suspended Solids
    82-001105
  Temperature
    82-000694
  Turbidity
    82-001105
Mugil capito
  Catecholamines
    82-000720
  Endocrinology
    82-000661
  Osmoregulation
    82-000661
    82-000720
Mugil cephalus
  Blood Chemistry
    82-000647
  Cadmium
    82-001144
  Osmoregulation
    82-000715
  Respiration
    82-000647
  Temperature
    82-000647
Mugilidae
  Identification
    82-000997
Mugul cephalus
  Heavy Metals
    82-001144
Muraenidae
  Misc. Behavior
    82-000803
Mustelus canis
  Blood Chemistry
    82-000718
  Cardio-Vascular System
    82-000718
Myctophidae
  Taxonomy
    82-001016
Myripristis hexagonus
  Taxonomy
    82-001020

Myripristis murdjan
  Taxonomy
    82-001020
Nannostomus beckfordi
  Aggressive Behavior
    82-000808
  Spawning
    82-000808
  Territorial Behavior
    82-000808
Negaprion acutidens
  Cleaning Behavior
    82-000807
Negaprion brevirostris
  Auditory Senses
    82-000794
  Bioenergetics
    82-000673
  Cleaning Behavior
    82-000807
  Dermophthirius
    82-001064
  Foods/Feeding
    82-000924
  Metabolic Rates
    82-000673
  Parasites/Diseases
    82-001064
  Predator/Prey Relationships
    82-000673
  Trematodes
    82-001064
  Vision
    82-000805
Neoditrema ransonneti
  Competition
    82-000804
  Habitat Selection
    82-000804
Notropis albeolus
  Habitat Selection
    82-000851
  Life History/General
    82-000851
Notropis ardens
  Habitat Selection
    82-000851
  Life History/General
    82-000851
Notropis buchanani
  Distribution/Geographical
    82-000975
Notropis callitaenia
  Hybridization
    82-000786
Notropis cerasinus
  Habitat Selection
    82-000851
  Life History/General
    82-000851
Notropis cornutus chrysocephalus
  Distribution/Geographical
    82-000981
Notropis lutrensis
  Flow Regimes
    82-000798
  Hybridization
    82-000786
  Temperature
    82-000798
  Temperature Selection
    82-000798
Notropis lutrensis x N. callitaenia
  Hybridization
    82-000786
Notropis rubricroceus
  Distribution/Geographical
    82-000981
Notropis simus
  Taxonomy
    82-001002
Notropis spectrunculus
  Distribution/Geographical
    82-000981
Notropis umbratilis
  Distribution/Geographical
    82-000975
Noturus miurus
  Life History/General
    82-000832
Oncorhynchus
  Abundance/Factors of
    82-000993
  Age/Growth
    82-001252
  Age/Length Composition
    82-001252
  Culture/Propagation
    82-000517
  Fish Stocks
    82-001248
  Genetic Strains
    82-000517
  Management/Research--Rivers and Streams
    82-001248
    82-001252
  Nursery Areas
    82-000839
  Stocking/Introductions
    82-000517
  Supplemental Stocking
    82-000517
Oncorhynchus kisutch
  Age/Length Composition
    82-000948
  Asbestos
    82-001115
  Bacterial Diseases
    82-001043
  Blood Chemistry
    82-000736
  Botulism
    82-001043
  Clostridium botulinum
    82-001043
  Corticosteroids
    82-000736

...CONTINUED...
Oncorhynchus kisutch
  Culture/Propagation
   82-000516
  Excretory System
   82-000630
  Lake Culture
   82-000516
  Length-Weight Relationships
   82-000948
  Marking/Tagging
   82-001188
  Parasites/Diseases
   82-001043
  Population Studies
   82-000948
  Strontium
   82-001188
Oncorhynchus masou
  Pheromones
   82-000880
  Sex Reversal
   82-000711
  Spawning
   82-000880
Oncorhynchus nerka
  Competition
   82-000917
  Foods/Feeding
   82-000917
   82-000937
  Population Studies
   82-001222
  Predator/Prey Relationships
   82-000937
Oncorhynchus rhodurus
  Endocrinology
   82-000708
  Pheromones
   82-000880
  Reproduction
   82-000708
  Spawning
   82-000880
  Steroids
   82-000708
Oncorhynchus tshawytscha
  Culture/Propagation
   82-000521
  Early Development
   82-000679
  Growth Stimulants
   82-000521
  IHP
   82-001059
  Orientation/Homing
   82-000827
  Parasites/Diseases
   82-001059
  Size at Release
   82-001202
  Spawning Migration
   82-000827
  Stocking/Introductions
   82-001202

...CONTINUED...
Oncorhynchus tshawytscha
  Temperature
   82-000679
  Viral Diseases
   82-001059
  Volcanic Ash
   82-000827
Ophichthidae
  Misc. Behavior
   82-000803
Ophidiiformes
  Swimbladder
   82-000595
Ophiocephalus maculatus
  Osmoregulation
   82-000753
  Salinity
   82-000753
Ophiocephalus punctatus
  Digestive System
   82-000670
Opisthonema
  Management/Research--Marine
   82-001270
  Yield
   82-001270
Opsanus beta
  Osmoregulation
   82-000650
Opsanus tau
  Protein Synthesis
   82-000677
  Temperature
   82-000677
Osmerus mordax
  Impingement/Entrainment
   82-001218
  Power Plants
   82-001218
Osteoglossum bicirrhosum
  Endocrinology
   82-000888
  Reproduction
   82-000888
  Spawning
   82-000888
Oxyeleotris marmoratus
  Henneguya shaharini
   82-001054
  Parasites/Diseases
   82-001054
  Protozoan Diseases
   82-001054
Pagrus major
  Lordosis
   82-000696
  Swimbladder
   82-000696
Pangasius sutchi
  Culture/Propagation
   82-000574
  Gamete Storage
   82-000574

- Papeliochromis
  - Taxonomy
    - 82-001022
- Paracilurus asotus
  - Digestive System
    - 82-000756
  - Enzymes
    - 82-000757
  - Hormones
    - 82-000756
  - Pancreas
    - 82-000757
- Paralichthys dentatus
  - Bibliographies
    - 82-001277
  - Digestion Rates
    - 82-000645
  - Digestive System
    - 82-000645
  - Life History/General
    - 82-001277
  - Management/Research--Marine
    - 82-001277
  - Movements
    - 82-000896
  - Nitrogen Metabolism
    - 82-000645
- Parapristipoma trilineatum
  - Foods/Feeding
    - 82-000921
- Parasilurus asotus
  - Coloration
    - 82-000606
- Parophrys vetulus
  - Age/Growth
    - 82-000954
  - Aromatic Hydrocarbons
    - 82-001134
  - Naphthalene
    - 82-001134
  - Upwelling
    - 82-000954
- Peocilia chica
  - Pheromones
    - 82-000796
- Peocilia reticulata
  - Sex Determination
    - 82-000771
- Perca flavescens
  - Electrophoresis
    - 82-000777
  - Endocrinology
    - 82-000745
  - Foods/Feeding/Selectivity
    - 82-000922
  - Impingement/Entrainment
    - 82-001218
  - Power Plants
    - 82-001218
  - Predator/Prey Relationships
    - 82-000922
  - Steroids
    - 82-000745

...CONTINUED...
- Perca flavescens
  - Themperature Selection
    - 82-000820
  - Thermal Pollution
    - 82-000820
  - Variation Studies
    - 82-000777
- Perca fluviatilis
  - Digestive System
    - 82-000714
  - Eutrophication
    - 82-001090
  - Reproductive System
    - 82-000714
  - Temperature
    - 82-000700
- Percina maculata x P. caprodes
  - Hybridization
    - 82-000770
- Petromyzon marinus
  - Digestive System
    - 82-000758
    - 82-000759
  - Electrophoresis
    - 82-000764
    - 82-000775
  - Endocrinology
    - 82-000695
  - Fish Stocks
    - 82-000764
    - 82-000775
  - Genetic Strains
    - 82-000764
  - Management/Research--Lakes
    - 82-000775
  - Metamorphosis
    - 82-000758
  - Variation Studies
    - 82-000775
- Phalloceros caudimaculatus
  - Electrophoresis
    - 82-001027
  - Identification
    - 82-001027
  - Morphology
    - 82-001027
- Pholis ornata
  - Habitat Selection
    - 82-000792
- Phoxinus phoxinus
  - Diplostomum phoxini
    - 82-001061
  - Parasites/Diseases
    - 82-001061
  - Trematodes
    - 82-001061
- Pimephales promelas
  - Air Breathing
    - 82-000697
  - Bioassay Techniques
    - 82-001114
  - Coal Conversion Effluents
    - 82-001114

...CONTINUED...
Pimephales promelas
  Fecundity
    82-000877
  Parasites/Disease
    82-001081
  Phenols
    82-001120
  Posthodiplostomum minimum minimum
    82-001081
  Pugheadedness
    82-000592
  Respiration
    82-000697
  Spawning
    82-000877
  Trematodes
    82-001081
Plagopterus argentissimus
  Flow Regimes
    82-000988
Platichthys flesus
  Hypoxia
    82-000739
Platichthys stellatus
  Anemia
    82-000754
  Blood Chemistry
    82-000754
  Parasites/Diseases
    82-000754
Plecoglossus altivelis
  Bacterial Diseases
    82-001046
  Parasites/Diseases
    82-001046
  Streptococcus
    82-001046
Plecoglosus altivelis
  Vibriosis
    82-001046
Pleuronectes platessa
  Gynogenesis
    82-000782
  Healing
    82-000681
  Hypoxia
    82-000739
Pleuronectidae
  BAP
    82-001121
  Oil
    82-001121
Poecilia
  Behavior
    82-000795
  Genetics
    82-000795
  Pheromones
    82-000795
Poecilia reticulata
  Phenols
    82-001117
  Trimethylphosphate
    82-001119
Poeciliopsis
  DMBA
    82-001136
  Status
    82-001162
Poeciliopsis occidentalis occidentalis
  Floods
    82-000987
Pollimyrus isidori
  Electric Organs
    82-000750
Polyodon spathula
  Blindness
    82-001084
  Exploitation Rates
    82-000845
  Life History/General
    82-000845
  Mortality Rates
    82-000845
  Parasites/Diseases
    82-001084
  Population Studies
    82-000845
Polypterus bichir
  Embryology
    82-000613
Pomacentrus bankanensis
  Territorial Behavior
    82-000812
Pomadasys
  Taxonomy
    82-001013
Pomatomus saltatrix
  Blood Chemistry
    82-000718
  Cardio-Vascular System
    82-000718
Pomoxis annularis
  Foods/Feeding/Selectivity
    82-000942
Prototroctes maraena
  Biochemical Composition
    82-000638
Pseudoapistogramma
  Taxonomy
    82-001022
Pseudogeophagus
  Taxonomy
    82-001022
Pseudopleuronectes americanus
  Activity Patterns
    82-000799
  Digestion Rates
    82-000688
  Excretory System
    82-000729
  Glugea stephani
    82-001056
  Gyrodactylus pleuronecti
    82-001066
  Hormones
    82-000665

## SYSTEMATIC INDEX

...CONTINUED...
- Pseudopleuronectes americanus
  - Parasites/Diseases
    - 82-001056
    - 82-001066
  - Protozoan Diseases
    - 82-001056
  - Taurine
    - 82-000729
  - Temperature
    - 82-000799
  - Temperature Selection
    - 82-000799
  - Trematodes
    - 82-001066
- Pungitius pungitius
  - Activity Patterns
    - 82-000941
  - Foods/Feeding
    - 82-000941
- Puntius gonionotus
  - Culture/Propagation
    - 82-000574
  - Gamete Storage
    - 82-000574
- Puntius melanampyx singhala
  - Taxonomy
    - 82-001008
- Puntius sophore
  - Heavy Metals
    - 82-001123
  - Zinc
    - 82-001123
- Pylodictis olivaris
  - Age/Growth
    - 82-000958
- Raja
  - Foods/Feeding
    - 82-000901
- Raja erinacea
  - Excretory System
    - 82-000729
  - Taurine
    - 82-000729
- Rhodeus ocellatus ocellatus
  - Movements
    - 82-000872
  - Pheromones
    - 82-000879
  - Population Studies
    - 82-000872
  - Spawning
    - 82-000879
- Rhombosolea retiaria
  - Digestive System
    - 82-000732
- Rutilus rutilus
  - Cestodes
    - 82-001073
  - Digestion Rates
    - 82-000685
  - Hybridization
    - 82-000781
  - Ligula intestinalis
    - 82-001073

...CONTINUED...
- Rutilus rutilus
  - Parasites/Diseases
    - 82-001073
  - Temperature
    - 82-000700
- Salmo apache
  - Life History/General
    - 82-001165
  - Management/Research--General
    - 82-001165
- Salmo clarki
  - Management/Research--General
    - 82-001152
  - New Subspecies
    - 82-001152
  - Taxonomy
    - 82-001152
- Salmo clarki clarki
  - Management/Research--Rivers and Streams
    - 82-001245
  - Status
    - 82-001245
- Salmo clarki henshawi
  - Management/Research--Lakes
    - 82-001233
- Salmo clarki utah
  - Life History/General
    - 82-000831
  - Management/Research--General
    - 82-000831
- Salmo gairdneri
  - Acephate
    - 82-001147
  - Acid Mine Water
    - 82-001104
  - Acids
    - 82-001126
  - Activity Patterns
    - 82-000802
  - Age/Growth
    - 82-000518
    - 82-000930
  - Anemia
    - 82-000754
  - Anesthetics
    - 82-000565
  - Aroclor
    - 82-001145
  - Bacterial Diseases
    - 82-001039
    - 82-001044
  - Blood Chemistry
    - 82-000693
    - 82-000712
    - 82-000713
    - 82-000727
    - 82-000744
    - 82-000754
  - Cardio-Vascular System
    - 82-000657
  - Competition
    - 82-000917
  - Copper
    - 82-001126

...CONTINUED...
Salmo gairdneri
 Culture/Propagation
  82-000518
  82-000522
  82-000540
  82-000554
  82-000561
  82-000563
 Digestive System
  82-000686
 Dimethylformamide
  82-001187
 Diplostomum spathaceum
  82-001083
 Distribution/Geographical
  82-000962
 Economic Values
  82-001186
 Egtved Virus
  82-001060
 Endocrinology
  82-000643
  82-000689
  82-000698
  82-000782
 Enzymes
  82-000654
 Excretory System
  82-000830
 Feeding Mechanisms
  82-000561
 Feeding Experiments
  82-000563
 Feeds
  82-000544
  82-000556
 Fertilization
  82-000639
 Fins
  82-000607
 Fish Stocks
  82-000920
 Flow Regimes
  82-001147
 Foods/Feeding
  82-000517
  82-000536
  82-000563
 Gills
  82-000621
 Growth Stimulants
  82-000522
 Heavy Metals
  82-001126
 Hormones
  82-000643
  82-000686
  82-000713
 Hydrocarbons
  82-001093
 Hypoxia
  82-000736
  82-000746

...CONTINUED...
Salmo gairdneri
 IHN
  82-001069
 Immune Response
  82-000728
 Insecticides
  82-001124
  82-001142
  82-001147
 Invertebrate Forage
  82-000694
 IPN
  82-001113
 Life History/General
  82-000830
 Light
  82-000899
  82-000902
 Lipid Metabolism
  82-000563
 Liver
  82-000728
 Management/Research--Reservoirs
  82-001186
  82-001208
 Metacil
  82-001142
 Metabolic Rates
  82-000700
 Mitogens
  82-000728
 Movements
  82-001196
  82-001197
 MS-222
  82-000865
 Muscular Dystrophy
  82-000561
 Nephrocalcinosis
  82-001072
 Nutrition
  82-000552
  82-000561
  82-000563
 Nutritional Diseases
  82-001072
 Organophosphates
  82-001147
 Parasites/Diseases
  82-000561
  82-000754
  82-001039
  82-001049
  82-001059
  82-001060
  82-001072
  82-001083
  82-001086
  82-001113
 Pentachlorophenol
  82-001130
 Phosphorus
  82-001126

...CONTINUED...
- Salmo gairdneri
  - pH
    - 82-001104
  - Polychlorinated Biphenyls
    - 82-001165
  - Polyculture
    - 82-000518
  - Proliferative Kidney Disease
    - 82-001086
  - Pulp Mill Effluents
    - 82-001132
  - Put-and-Take
    - 82-0011[illegible]
    - 82-001197
  - Reproduction
    - 82-000648
    - 82-000669
    - 82-000730
  - Salinity
    - 82-000639
  - Sekoke Disease
    - 82-000641
  - Selenium
    - 82-000683
  - Spawning
    - 82-000490
  - Starvation
    - 82-000654
    - 82-000682
  - Sterilization
    - 82-000515
  - Steroids
    - 82-000790
  - Stocking/Introductions
    - 82-001195
    - 82-001197
    - 82-001269
  - Stress
    - 82-000868
  - Surfactants
    - 82-001133
  - Swimming Performance
    - 82-000709
    - 82-000826
  - Taste Reception
    - 82-000601
  - Tetrachloroethylene
    - 82-001137
  - Transportation
    - 82-000565
  - Trematodes
    - 82-001083
  - Tylodelphys clavata
    - 82-001083
  - Vibriosis
    - 82-001046
  - Viral Diseases
    - 82-001039
    - 82-001080
    - 82-001113
  - Visceral Granuloma
    - 82-001072
  - Vision
    - 82-[illegible]

...CONTINUED...
- Salmo gairdneri
  - Vision
    - 82-000882
  - Vitellogenin
    - 82-000643
- Salmo gilae
  - Life History/General
    - 82-001165
  - Management/Research--General
    - 82-001165
- Salmo salar
  - Fish Stocks
    - 82-000843
  - Age/Growth
    - 82-000518
    - 82-000953
  - Bacterial Diseases
    - 82-001040
  - Culture/Propagation
    - 82-000518
  - Egg Size
    - 82-000773
  - Endocrinology
    - 82-000689
  - Fish Stocks
    - 82-000783
    - 82-001253
  - Flow Regimes
    - 82-000843
  - Healing
    - 82-000681
  - Hormones
    - 82-000689
  - Hybridization
    - 82-000773
  - Immune Response
    - 82-001040
  - Immunization
    - 82-001040
  - Management/Research--General
    - 82-000783
  - Management/Research--Rivers and Streams
    - 82-001253
  - Movements
    - 82-000881
  - Orientation/Homing
    - 82-000889
  - Parasites/Diseases
    - 82-001040
    - 82-001058
  - Polyculture
    - 82-000518
  - Spawning Migration
    - 82-000843
    - 82-000875
    - 82-000889
  - Stocking/Introductions
    - 82-001253
  - Temperature
    - 82-000843
  - Viral Diseases
    - 82-001058
  - Viral Hemorrhagic Septicemia
    - 82-001058
- Salmo trutta
  - Age/Growth
    - 82-000518

...CONTINUED...
Salmo trutta
  Age/Growth
    82-000737
    82-000953
  Bacterial Diseases
    82-001039
  Culture/Propagation
    82-000518
  Diplostomum spathaceum
    82-001083
  Egg Size
    82-000773
  Flow Regimes
    82-001247
  Foods/Feeding
    82-000737
    82-000938
  Hybridization
    82-000773
  Lipid Metabolism
    82-000737
  Management/Research--Reservoirs
    82-001200
  Movements
    82-001195
  Osmoregulation
    82-000705
  Parasites/Diseases
    82-001039
    82-001083
  pH
    82-000706
  Polyculture
    82-000518
  Put-and-Take
    82-001195
  Stocking/Introductions
    82-001195
    82-001200
  Stress
    82-000722
  Temperature
    82-000737
  Trematodes
    82-001083
  Tylodelphys clavata
    82-001083
Salmonidae
  Abundance/Factors of
    82-000994
  Age/Growth
    82-000994
  Culture/Propagation
    82-000520
  Endangered/Threatened Species
    82-001169
  Enzymes
    82-000706
  Fish Counters
    82-001219
  Fish Stocks
    82-000776
    82-001169

...CONTINUED...
Salmonidae
  General
    82-000510
  Grazing
    82-001177
  Management/Research--General
    82-000776
    82-001161
  Management/Research--Rivers and Streams
    82-001248
  Mortality Rates
    82-000994
  Population Genetics
    82-000776
  Restoration of Anadromous Runs
    82-001244
  Riparian Habitat
    82-001177
Salvelinus
  Taxonomy
    82-001015
Salvelinus alpinus
  Foods/Feeding
    82-000928
Salvelinus fontinalis
  Abundance/Factors of
    82-000874
  Aeromonas salmonicida
    82-001041
    82-001042
  Bacterial Diseases
    82-001041
    82-001042
  Electophoresis
    82-000769
  Endocrinology
    82-000745
  Furunculosis
    82-001041
  Genetic Strains
    82-001194
    82-001203
  Hatching Success
    82-000989
  Immunization
    82-001042
  IPN
    82-001113
  Mortality Factors
    82-000989
  Movements
    82-001195
  Nephrocalcinosis
    82-001072
  Nutritional Diseases
    82-001072
  Parasites/Diseases
    82-001041
    82-001042
    82-001072
    82-001113
  Production
    82-000874

...CONTINUED...
Salvelinus fontinalis
 Put-and-Take
  82-001195
 Steroids
  82-000748
 Stocking/Introductions
  82-001194
  82-001195
  82-001203
 Survival
  82-001198
  82-001203
 Variation Studies
  82-000769
 Viral Diseases
  82-001113
 Visceral Granuloma
  82-001072
 Year Class Strength
  82-000874
Salvelinus malma
 Foods/Feeding
  82-000928
Salvelinus namaycush
 Fish Stocks
  82-001230
  82-001232
 Management/Research—Lakes
  82-001230
  82-001232
 Movements
  82-001199
 Spawning
  82-001199
 Stocking/Introductions
  82-001199
 Supplemental Stocking
  82-001199
 Survival
  82-001199
Sarotherodon galilaeus
 Foods/Feeding
  82-000908
 Predator/Prey Relationships
  82-000908
Sarotherodon galilaeus
 Foods/Feeding
  82-000910
Sciaenidae
 Distribution/Geographical
  82-000942
Scomber scombrus
 Distribution/Seasonal
  82-000895
 Foods/Feeding
  82-000895
 Kudoa scombri
  82-001069
 Parasites/Diseases
  82-001069
 Trematodes
  82-001069
Scombridae
 Digestive System
  82-000703

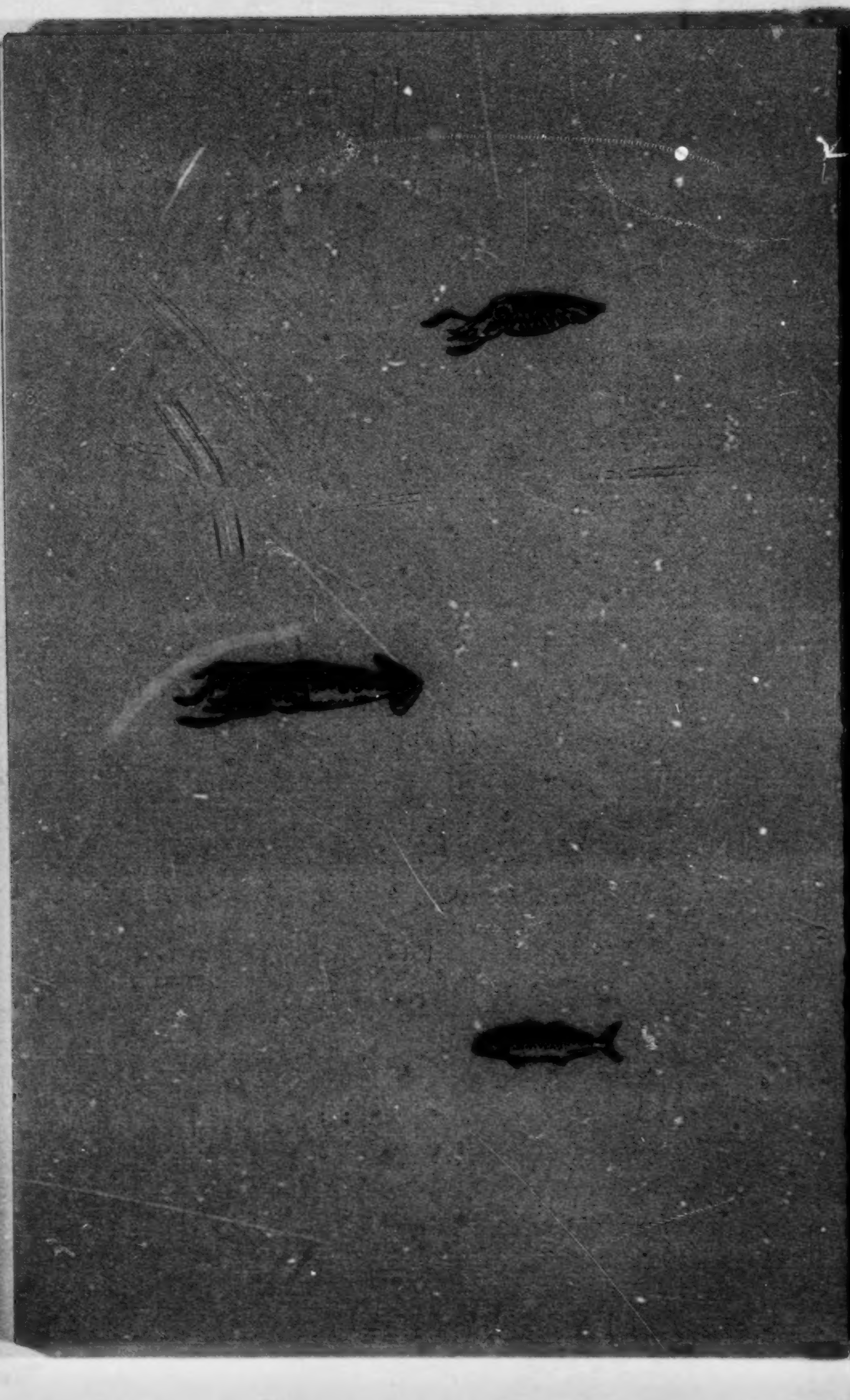
...CONTINUED...
Scombridae
 Enzymes
  82-000703
Scophthalmus maximus
 Culture/Propagation
  82-000541
 Recirculating Systems
  82-000541
Scorpaenidae
 Age/Growth
  82-000854
 Mortality Rates
  82-000854
Scyliorhinus canicula
 Osmoregulation
  82-000634
Scymnorhinus licha
 Foods/Feeding
  82-000927
Sebastes auriculatus
 Abnormalities
  82-000589
 Pugheadedness
  82-000589
Sebastes diploproa
 Age/Growth
  82-000946
 Light
  82-000946
 Temperature
  82-000946
Seriola quinqueradiata
 Blood
  82-000611
 Cardio-Vascular System
  82-000611
Serranidae
 Fish Lists/Keys
  82-000976
Solea solea
 Black Patch Necrosis
  82-001080
 Culture/Propagation
  82-000539
  82-000545
 Culture/Propagaton
  82-000547
 Feeding Experiments
  82-000545
  82-000547
 Fingerling Production
  82-000539
  82-000545
  82-000547
 Parasites/Diseases
  82-001080
Sprattus sprattus
 Acoustico-Lateralis System
  82-000593
 Population Studies
  82-000856
  82-000870
  82-000871

...CONTINUED...
Sprattus sprattus
  Recruitment
    82-000871
Squalus acanthias
  Excretory System
    82-000729
  Glucose
    82-000640
  Parasites/Diseases
    82-001088
  Skin Lesions
    82-001088
  Taurine
    82-000729
Stizostedion vitreum
  Foods/Feeding/Selectivity
    82-000922
  Predator/Prey Relationships
    82-000922
Stizostedion vitreum vitreum
  Age/Growth
    82-000982
  Electrophoresis
    82-000768
  Fecundity
    82-000768
  Fish Stocks
    82-000768
  Management/Resources-General
    82-000768
  Maturation
    82-000768
  Variation Studies
    82-000758
Syngnathus [illegible]
  Taxonomy
    82-001007
Tandanus tandanus
  Spawning
    82-000686
Tautogolabrus adspersus
  Blood Chemistry
    82-000686
Tetraodontiformes
  Dentition
    82-000590
Theragra chalcogramma
  Maturation
    82-000758
Thunnus alalunga
  Scales
    82-000617
Thunnus albacares
  Fishing Gear
    82-001213
  Longlines
    82-001213
Thymallus thymallus
  Identification
    82-001191
  Individual Marking
    82-001191
  Marking/Tagging
    82-001191
Tilapia
  Movements
    82-000899
  Sex Determination
    82-000569
Tilapia aurea
  Cage Culture
    82-000524
  Culture/Propagation
    82-000524
    82-000527
    82-000573
    82-001215
  Fertilization/Soil and Water
    82-001215
  Pond Culture
    82-000527
    82-001215
  Rearing Capacity
    82-000527
  Selective Breeding
    82-000526
  Sex Reversal
    82-000572
  Tank Culture
    82-000527
  Temperature
    82-000731
Tilapia mariae
  Temperature
    82-000731
Tilapia melanotheron
  Temperature
    82-000731
Tilapia mossambica
  Culture/Propagation
    82-000527
    82-000551
  Culture/Propagation
    82-000550
  Diets
    82-000550
  Endocrinology
    82-0 0666
  Feeding Experiments
    82-000550
  Hermaphroditism
    82-000728
  Hormones
    82-000710
  Nutrition
    82-000551
  Osmoregulation
    82-000648
  Pond Culture
    82-000527
  Rearing Capacity
    82-000527
  Sex Determination
    82-000710
  Tank Culture
    82-000527
  Temperature
    82-000731

[illegible]

Tilapia nilotica
  Blood Chemistry
    82-000761
  Enzymes
    82-000761
  Otoliths
    82-000469
[illegible]
  Taxonomy
    82-001628
Tinca tinca
  [illegible]
    82-001609
  Parasites/Diseases
    82-001609
  Trematodes
    82-001609
Tor
  Karyotypes
    82-000770
Torpedo marmorata
  Auditory Senses
    82-000462
  Electric Organs
    82-000663
    82-000721
  Otoliths
    82-000658
Torpedo nobiliana
  Auditory Senses
    82-000462
  Otoliths
    82-000658
Torpedo ocellata
  Electric Organs
    82-000721
[illegible]
  New Species
    82-001631
[illegible]
  [illegible]
    82-001070
  Parasites/Diseases
    82-001070
  Parasitic Isopods
    82-001070
[illegible]
  [illegible]
    82-000717
  [illegible]
    82-000717
[illegible]
  Oil
    82-000130
[illegible]
  [illegible]
    82-000777
  [illegible]
    [illegible]
[illegible]
  [illegible]
    [illegible]

[illegible]
  Movements
    82-000647
  Spawning
    82-000648



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# SPORT FISHERY ABSTRACTS

Vol. 27, No. 3, 1982

DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE

UNITED STATES DEPARTMENT OF THE INTERIOR

# SPORT FISHERY ABSTRACTS

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*Sport Fishery Abstracts* is intended to furnish fishery biologists with abstracts of current literature pertinent to sport fishery research and management.

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# SPORT FISHERY ABSTRACTS

An abstracting service for fishery research and management

Volume 27 Number 3 1982

## CONTENTS

### CULTURE AND PROPAGATION

General Fish Culture .......... 1
Trout and Salmon Culture .......... 1
Other Anadromous Species Culture .......... 2
Warmwater Culture .......... 2
Mariculture .......... 5
Feeds, Feeding and Nutrition .......... 6
Transporting Fish .......... 9
Aquariums .......... 10
Miscellaneous Culture Techniques and Equipment .......... 10

### LIMNOLOGY AND OCEANOGRAPHY

General .......... 11
Physical .......... 11
Chemical .......... 11
Benthos .......... 12
Plankton .......... 12
Primary Production .......... 12

### MORPHOLOGY, PHYSIOLOGY, GENETICS AND BEHAVIOR

Morphology .......... 13
Physiology .......... 16
Genetics, Variation Studies, Hybridization .......... 34
Behavior .......... 38

### NATURAL HISTORY

Life Histories - General Works .......... 45
Population Studies - Production, Standing Crop, Recruitment. 48
Spawning Habits and Movements, Sex Ratios, Fecundity, etc... 50
Movements, Seasonal and Depth Distribution, etc .......... 53
Foods and Feeding .......... 53
Age and Growth .......... 59
Geographical Distribution, Fish surveys, etc .......... 64
Abundance, Factors of; Survival and Mortality .......... 68
Identification, Keys, Classification .......... 70

### PARASITES AND DISEASES

General .......... 73
Bacterial .......... 74
Protozoan .......... 77
Viral .......... 79
Other .......... 81

### POLLUTION AND TOXICOLOGY

Pollution .......... 84
Fish Kills .......... 87
Toxicology; Bioassays .......... 87
Fish Toxicants .......... 96

RESEARCH AND MANAGEMENT

General .... 96
Reports of Fishery Stations, States, etc .... 97
Habitat Alteration .... 97
Harvest, Creel Census, etc .... 100
Regulations .... 100
Marking and Tagging .... 101
Stocking and Introductions .... 102
Fishing Gear and Techniques .... 102
Fertilization of Water and Soil .... 105
Fishways, Fish Passage through Dams, etc .... 105
Mathematical, Statistical Methods and Modeling .... 105
Lake Management and Research .... 106
River and Stream Management and Research .... 107
Farm Pond and Small Impoundment Management and Research .... 108
Large Impoundment Management and Research .... 108
Estuary Management and Research .... 109
Marine Management and Research .... 109
Utilization of Fishery Products .... 111
Miscellaneous Techniques and Equipment .... 111
Reviews, Bibliographies, etc .... 113

AUTHOR INDEX (Salmon) .... 115
GEOGRAPHIC INDEX (Yellow) .... 139
SYSTEMATIC INDEX (Blue) .... 143

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## GENERAL FISH CULTURE

82-001278 Arrignon, J. C. V. REGARDS SUR L'AQUACULTURE MONDIALE. [SOME COMMENTS ON AQUACULTURE WORLD-WIDE.] *Aquaculture* 27(3):165-186. Apr. 1982. In French with English summ. SFA 27(3)
[Dev. Pêche, Piscicult. Aquacult., B.P. 494, Bouaké, Ivory Coast]

82-001279 Coche, A. G., (compiler). AQUACULTURE IN MARINE WATERS. A LIST OF REFERENCE BOOKS, 1961-1981. *FAO Fish. Circ.* No. 723. Rev. 1. vii + 18p. Feb. 1982. SFA 27(3)
[FAO of the UN, Rome, Italy]

82-001280 Roys, R. S. ISSUES, PROBLEMS AND SOLUTIONS RELATING TO ALASKAN AQUACULTURE. *Proc. Annu. Conf. West. Assoc. Fish Wildl. Agencies* 61:212-218. 1981. SFA 27(3)
[Alaska Dep. Fish Game, Juneau]

82-001281 Sarig, S. FISHERIES AND FISH CULTURE IN ISRAEL IN 1980. *Bamidgeh* 34(1):3-19. Mar. 1982. SFA 27(3)
[Lab. Res. Fish Dis., Nir-David, Israel]

82-001282 Toffoli, E. V. RESOURCE MANAGEMENT THROUGH THE USE OF AQUACULTURE IN CALIFORNIA. *Proc. Annu. Conf. West. Assoc. Fish Wildl. Agencies* 61:205-207. 1981. SFA 27(3)
[Calif. Dep. Fish Game, Sacramento] Since the 1870's, California has endeavored to provide management programs to sustain its fish and wildlife resources. As a result of manipulation of existing water resources, loss of habitat and a steadily increasing population, the state has had to rely more and more on aquaculture techniques to maintain our fisheries. Artificially reared fish and shellfish have been planted in our waters to reduce the pressure on native populations and to provide new fishing opportunities in artificial impoundments in water-deficient areas of the state. Experimental programs are now being conducted to determine if enhancement programs are also possible for our estuarine and marine areas.

## TROUT AND SALMON CULTURE

82-001283 Garrell, M. H. and L. E. Strait. SEEFORELLEN IN NEW YORK. *N.Y. Fish Game J.* 29(1):97-100. Jan. 1982. SFA 27(3)
[Phys. Dep., Adelphi Univ., Smith Ave., Garden City, NY 11530]

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82-001284 Gladson, J. OCEAN SALMON RANCHING PRIVATE AQUACULTURE IN OREGON. *Oreg. Wildl.* 37(6):3-9. June 1982. SFA 27(3)

82-001285 Sower, S. A.; C. B. Schreck and E. M. Donaldson. HORMONE-INDUCED OVULATION OF COHO SALMON (*ONCORHYNCHUS KISUTCH*) HELD IN SEAWATER AND FRESH WATER. *Can. J. Fish. Aquatic Sci.* 39(4):627-632. Apr. 1982. In English with French summ. SFA 27(3)
[Dep. Zool., Univ. Wash., Seattle 98195]

## OTHER ANADROMOUS SPECIES CULTURE

82-001286 Parmley, D. A COMPARISON OF THREE POND MANAGEMENT PROGRAMS UTILIZED TO PRODUCE STRIPED BASS. *Annu. Proc. Tex. Chap. Am. Fish. Soc.* 4:19-33. 1981[1982]. SFA 27(3)
[Tex. Parks Wildl. Dep., Possum Kingdam Fish Hatchery, Graford 76045]

## WARMWATER CULTURE

82-001287 Adelman, I. R. ENHANCEMENT OF GROWTH OF COMMON CARP BY INJECTION OF A HOMOGENATE OF CARP PITUITARY GLANDS. *Prog. Fish-Cult.* 44(2):94-97. Apr. 1982. SFA 27(3)
[Dep. Entomol. Fish. Wildl., Univ. Minn., St. Paul 55108]

82-001288 Brooks, M. J.; R. O. Smitherman; J. A. Chappell and R. A. Dunham. SEX-WEIGHT RELATIONS IN BLUE, CHANNEL, AND WHITE CATFISHES: IMPLICATIONS FOR BROOD STOCK SELECTION. *Prog. Fish-Cult.* 44(2):105-107. Apr. 1982. SFA 27(3)
[220-A Dexter Arms, Playa de Coco, Guanacastel, Costa Rica]

82-001289 Brown, S. W. and C. E. Boyd. OFF-FLAVOR IN CHANNEL CATFISH FROM COMMERCIAL PONDS. *Trans. Am. Fish. Soc.* 111(3):379-383. May 1982. SFA 27(3)
[Dep. Fish. Allied Aquacult., Agric. Exp. Stn., Auburn Univ., AL 36849]

82-001290 Bry, C. and Y. Souchon. PRODUCTION OF YOUNG NORTHERN PIKE FAMILIES IN SMALL PONDS: NATURAL SPAWNING VERSUS FRY STOCKING. *Trans. Am. Fish. Soc.* 111(4):476-480. July 1982. SFA 27(3)
[Lab. Physiol. Poissons, Inst. Natl. Rech. Agron., 78350 Jouy-en-Josas, France]

82-001291 Dadzie, S. SPECIES COMBINATION IN TILAPIA CULTURE. *Aquaculture* 27(3):295-299. Apr. 1982. SFA 27(3)
[FAO Afr. Reg. Aquacult. Cent., P.M.B. 6165, Port Harcourt, Nigeria]
Preliminary determinations for the best species combination for the fastest rate of growth of *Tilapia nilotica (Sarotherodon niloticus)* and *T. zillii* indicated that *T. nilotica* grew better (1.3 g/day) when raised

## WARMWATER CULTURE (CONTINUED)

82-001291 CONTINUED with *T. zillii* (0.9 g/day) and common carp, *Cyprinus carpio* (3.2 g/day). In other nonreplicated experiments involving *T. nilotica* and *T. zillii* only, growth rates of 1.0 g/day and 0.9 g/day were recorded respectively which bettered those observed in monoculture experiments, namely 0.8 g/day and 0.6 g/day respectively.

82-001292 Dia, A. K. ETUDE DE LA CROISSANCE DES JUVENILES DE *CHRYSICHTHYS WALKERI* (GÜNTHER) EN ETANG EN FONCTION DE LA DENSITE. [A STUDY OF THE GROWTH OF JUVENILES OF *CHRYSICHTHYS WALKERI* (GÜNTHER) IN PONDS IN RELATION TO DENSITY.] *Aquaculture* 27(3):187-195. Apr. 1982. In French with English summ. SFA 27(3)
[Cent. Rech. Oceanogr., B.P.V 18, Abidjan, Ivory Coast]

82-001293 Dunham, R. A. RESPONSE TO SELECTION AND REALIZED HERITABILITY FOR BODY WEIGHT IN THREE STRAINS OF CHANNEL CATFISH GROWN IN EARTHEN PONDS. *Ph.D. dissertation, Auburn Univ.* 58p. 1982. From Diss. Abstr. Int. B Sci. Sci. Eng. 42(10):3892. Apr. 1982. SFA 27(3)

Response to selection and realized heritability for body weight were determined for three strains of channel catfish grown in earthen ponds at 7,500/ha. The three populations, Rio Grande (Texas), Marion (Alabama), and Kansas (Kansas), had different histories of domestication, 10 years, 20 years, and 60 years, respectively. At a harvest weight of approximately 500g, the largest 10 percent of each population was selected. The growth performance of progeny from selected fish was compared to that of progeny from randomly chosen fish. Significant responses to selection ($P<0.001$) of 63, 73, and 54g (17, 18, and 12 percent increase in body weight) were obtained from Rio Grande, Marion, and Kansas strains, respectively. Response was higher for Marion than for Kansas ($P<0.001$) and Rio Grande ($P<0.05$). Generally, the fish with the least amount of domestication had the highest response. Realized heritability for Marion, $0.50 \pm 0.13$, was higher ($P<0.01$) than that for Rio Grande, $0.24 \pm 0.06$. Kansas, 0.333%0.10, did not differ ($>0.05$) from Rio Grande or Marion. Responses for male and female body weights were the same in Marion ($P>0.05$) but response by Kansas males was higher than that for Kansas females ($P<0.05$). There were no significant differences in realized heritabilites for male and female body weights ($P>0.05$). One or more progeny groups from select brood fish had significantly greater growth during the first summer, growth during first winter, growth during second summer, food consumption rate, disease resistance, and/or feeding vigor than progeny from random brood fish. Selection for body weight did not affect the traits: spawning success, egg hatchability, harvestability and dressing percentage. Fecundity was higher ($P<0.05$) for female catfish selected for body weight in the Rio Grande strain but not in the Marion and Kansas strains. Head percentage was higher for processed Rio Grande selects ($P<0.01$) than for their corresponding randoms. There was no difference in processing characteristics between selects and randoms in the other two populations.

82-001294 Engelhardt, T. PRODUCTION OF HYBRID SUNFISH. *Proc. Fish. Farm Conf. Annu. Conf. Fish Farm. Tex.* 1981:46-50. 1981. SFA 27(3)
[Tex. Parks Wildl. Dep., P.O. Box 68, Lewisville 75067]

82-001295 Guerrero, R. D. III. DEVELOPMENT, PROSPECTS AND PROBLEMS OF THE TILAPIA CAGE CULTURE INDUSTRY IN THE PHILIPPINES. *Aquaculture* 27(3):313-315. Apr. 1982. SFA 27(3)
[Coll. Inland Fish. Cent. Luzon State Univ., Nueva Ecija, Philippines]
The Philippines has vast freshwater resources for cage culture of fish. Two tilapia species, *Tilapia mossambica* and *Tilapia nilotica*, are

## WARMWATER CULTURE (CONTINUED)

82-001295 CONTINUED cultured commercially in cages in several lakes. Field testing for cage culture of *Tilapia nilotica*, the preferred species, is described. A pilot commercial cage farm has been established. The major problems affecting development are the short supply of quality fingerlings, the lack of a standard commercial feed, and the increasing costs of cage construction. Recommendations for resolving these problems are given.

82-001296 Lock, J. T. PRODUCTION AND USE OF GRASS CARP. *Proc. Fish Farm. Conf. Annu. Conv. Fish Farm. Tex.* 1981:6-29. 1981. SFA 27(3)
[Tex. Agric. Ext. Serv., P.O. Drawer 38, Overton 75684]

82-001297 Rabelahatra, A. IMPROVEMENT OF TECHNIQUES FOR CARP FRY PRODUCTION IN THE LABORATORY. *Aquaculture* 27(3):307-311. Apr. 1982. SFA 27(3)
[Fish-Cult. Res. Div., For. Water Dep., P.O. Box 904, Antananarivo, Madagascar]

82-001298 Rothbard, S. INDUCED REPRODUCTION IN CULTIVATED CYPRINIDS--THE COMMON CARP AND THE GROUP OF CHINESE CARPS: II. THE REARING OF LARVAE AND THE PRIMARY NURSING OF FRY. *Bamidgeh* 34(1):20-32. Mar. 1982. SFA 27(3)
[Fish Aquacult. Res. Stn., Dor, Israel]

82-001299 Tave, D. and R. O. Smitherman. SPAWNING SUCCESS OF RECIPROCAL HYBRID PAIRINGS BETWEEN BLUE AND CHANNEL CATFISHES WITH AND WITHOUT HORMONE INJECTION. *Prog. Fish-Cult.* 44(2):73-74. Apr. 1982. SFA 27(3)
[Dep. Entomol. Fish. Wildl., Univ. Minn., St. Paul 55108]

82-001300 Wass, B. and K. Strawn. EXPERIMENTAL CULTURE OF MUD-MINNOW FOR THE LIVE BAIT INDUSTRY. *Proc. Fish Farm. Conf. Annu. Conv. Fish Farm. Tex.* 1981:88-97. 1981. SFA 27(3)
[Dep. Wildl. Fish Sci., Tex. A&M Univ., College Station 77843]

82-001301 White, B. L. HATCHERY PROPAGATION OF FLORIDA BASS. *Proc. Fish Farm. Conf. Annu. Conv. Fish Farm. Tex.* 1981:39-45. 1981. SFA 27(3)

82-001302 Williamson, J. H. COMPARING TRAINING SUCCESS BETWEEN TWO STRAINS OF LARGEMOUTH BASS. *Annu. Proc. Tex. Chap. Am. Fish. Soc.* 4:53-54. 1981[1982]. Abstract only. SFA 27(3)
[San Marcos Natl. Fish. Hatchery Dev. Cent., Rt. 1, Box 159-D, San Marcos, TX 78666] The study was conducted to determine if performance between two strains of largemouth bass, *Micropterus salmoides*, (Lacepede) was substantially different for an important intensive culture character--training success on formulated feed (Biodiet). During the training period (17-18 days) fingerlings were offered a pelleted diet which they accepted or starved. The San Marcos (Marion) and Inks Dam (northern) LMB strains were trained at San Marcos National Fish Hatchery and Development Center to accept formulated feed under similar conditions--a simulated production environment. One and one quarter inch fingerlings which had been reared using similar conditions were stocked at equal densities (0.20 kg/28.3 l), in triplicate, in indoor rectangular tanks (230.0 l). They received 1.6 mm (1/16 in) semi-moist Biodiet pellets at 15% stocked biomass/day throughout the taining period. Feed was delivered by automatic, clock-type feeders. Following training, survival or training success was calculated for each

## WARMWATER CULTURE (CONTINUED)

82-001302 CONTINUED strain. Training success with the ID(n) strain was 23.4% and the success of the SM(M) strain was 43.1%. The SM(M) strain performed 84.2% better than the ID(n) strain under similar conditions. The results provided in this study support the contention that genetic difference between the strains explains to a measureable extent the training success difference between the strains. This data as well as previous experience with both strains suggest significant gains in production and management are possible by exploiting the genetic potential of different strains of largemouth bass.

82-001303 Winfree, R. A. and R. R. Stickney. GROWTH RATES OF CHANNEL CATFISH CULTURED IN CENTRAL TEXAS. *Proc. Fish Farm. Conf. Annu. Conv. Fish Farm. Tex.* 1981:76-87. 1981. SFA 27(3)
[Dep. Wildl. Fish. Sci., Tex. A&M Univ., College Station 77843]

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82-001304 Bwathondi, P. O. J. PRELIMINARY INVESTIGATIONS ON RABBITFISH, *SIGNAUS CANALICULLATUS*, CULTIVATION IN TANZANIA. *Aquaculture* 27(3):205-210. Apr. 1982. SFA 27(3)
[Univ. Dar es Salaam, Inst. Mar. Sci., P.O. Box 668, Zanzibar, Tanzania]

82-001305 Chervinski, J. A NOTE ON THE EFFECTS OF LOW TEMPERATURE ON GOLDEN GREY MULLET *LIZA AURATA* (RISSO) MAINTAINED IN SEA-WATER PONDS. *Bamidgeh* 34(1):33-35. Mar. 1982. SFA 27(3)
[Fish Aquacult. Res. Stn., Dor, Israel]

82-001306 Chua, T. E. and S. K. Teng. EFFECTS OF FOOD RATION ON GROWTH, CONDITION FACTOR, FOOD CONVERSION EFFICIENCY, AND NET YIELD OF ESTUARY GROUPER, *EPINEPHELUS SALMOIDES* MAXWELL, CULTURED IN FLOATING NET-CAGES. *Aquaculture* 27(3):273-283. Apr. 1982. SFA 27(3)
[SEAFDEC Aquacult. Dep., Iloilo, Philippines] The effects of food ration on the growth and yield of the estuary grouper raised in floating net-cages were investigated. The optimum ration given on alternate days was 5% body weight (wet) which gave the best mean fish weight, uniform condition factor with time, relatively good survival rate, and greatest efficiency of food conversion. The maintenance, optimum and maximum food rations were 1.41, 5.75, and 9.0% body weight (wet) respectively. The fish were more uniform in size when fed 5-8% body weight. Though the yields at the end of the experiment were higher with high ration rates, the difference between rations of 5 and 9.1% body weight was 26.8 and 33.6%, whilst that between 5% and 2% body weight was 596%. For economic production, the ration should be approximately 5% of body weight supplied every 2 days.

82-001307 Davies, D. S. MARICULTURE DEVELOPMENT ON LONG ISLAND--LAND AND WATER USE CONSIDERATIONS. *Fisheries (Bull. Am. Fish. Soc.)* 7(2):11-13. Mar.-Apr. 1982. SFA 27(3)
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[Dep. Zool., Univ. N. H., Durham 03824] O-group and I-group winter (*Pseudopleuronectes americanus*) and smooth (*Liopsetta putnami*) flounder were reared at the Jackson Estuarine Laboratory, Durnam, NH, U.S.A., between November 1975 and June 1976. Both species gained weight approximately three times more rapidly in heated than in unheated water. In unheated water the smallest winter flounder gained, on average, 116% of their body weight per month. Larger O-group winter flounder increased body weight by 55% per month, while comparably sized female and male smooth flounder gained 52% and 28% per month, respectively. I-group female smooth flounder gained 9.5% and male smooth flounder 8.5% per month in heated water. In unheated water increases were 13%, 22%, and 14% per month for O-group winter, female smooth, and male smooth flounder, respectively. I-group winter flounder in unheated water gained weight twice as rapidly (9.5% per month) as I-group female and male smooth flounder (4.0% and 4.5% per month, respectively). Fish were fed a moist diet at a level of 10% of their body weight per day. Conversions (dry weight of food/wet weight of fish) ranged from 1:1 for O-group winter flounder in heated water to 27:1 for I-group smooth flounder in unheated water. Disease was a major cause of mortality. *Vibrio anguillarum* was confirmed as a pathogen; myxobacteria, and the protozoan parasites *Kudoa* sp. and *Nosema* sp. were associated with losses.

## FEEDS, FEEDING, AND NUTRITION

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[Anim. Prod. Dep., Fac. Agric., Ain Shams Univ., Cairo, Egypt] The commonly used cotton seed meal-wheat bran mixture for carp was replaced by activated sewage sludge to the extent of 0, 40, 70 and 100% in order to obtain the best calorie:protein ratio for growth. Duplicate water tanks were used and 46-day-old fish were studied for a period of 45 days during which they were fully fed on the experimental diets. Poor results were obtained when the mixture was completely replaced by activated sewage sludge due to low energy contents. However, partial replacement was favourable, especially at a rate of 40% which resulted in a diet containing about 56 gross protein value units and 2310 kcal ME/kg.

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[Hokkaido Salmon Hatchery, Nakanoshima, Toyohiraku, Sapporo, Hokkaido, Japan]

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[Inst. Fiskerifag, Univ. Tromsø, 9001 Tromsø, Norway] The segregation of plaice, *Pleuronectes platessa*, into groups of uniform size can be used to reduce the formation of size hierarchies, even under conditions of limited food supply. When access to food was limited the fish responded by becoming hyperphagic. This resulted in an increase in growth rate following an initial check. However, even after hyperphagic adaptation, intermittently fed fish grew at slower rates than those allowed more frequent access to food. Hyperphagia was accompanied by an increase in relative stomach weight and gastric capacity but did not affect fat storage and proximate chemical composition.

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[Inst. Zoophysiol., Univ. Innsbruck, Austria] An apparatus with dispensing system permitting continuous or intermittent supply of frozen plankton to fish fry has been developed. The advantage of this system is that thawed zooplankton can be offered in a continuous stream of water and thus can be eaten within a few seconds of thawing. In this way leaching effects are minimized. With this system larvae of *Coregonus lavaretus* were reared beyond metamorphosis to an average weight of 70-80 mg on both sieved (100-500 µm) and unsieved fractions of shockfrozen or slowly frozen zooplankton. Mortality was low and rates of growth comparable to those of fry fed with live *Artemia salina* nauplii.

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[Aquacult. Dep., Southeast Asian Fish. Dev. Cent. (SEAFDEC), Tigbauan, P.O. Box 256, Iloilo 5901, Philippines] Various extenders, containing potassium chloride, sodium chloride, glucose, sodium citrate, Ringer's solution, cow serum and milkfish serum were used to preserve milkfish (*Chanos chanos*) sperm at near-zero temperatures (0-4°C) and in liquid nitrogen (-196°C). Milkfish serum was a superior extender in both cases. After 5 days, comparatively good motility (>30%) and fertilizing capacity (6.7-18.9%) were observed in the near-zero liquid samples, while in other extenders, sperm ceased to show motility after 2 days. The fertilization success of 4-5 days cryopreserved sperm averaged 67.5% (n = 2) with milkfish serum, 60.5%(n = 2) with 400mM glucose, 58.0%(n = 2) with 150mM sodium chloride, 41.2%(n = 1) with Ringer's solution and 31.9%(n = 2) with cow serum.

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[Tex. Parks Wildl. Dep., Ingram 78025] Laboratory testing determined the ultimate upper lethal temperature ($LT_{50}$)_ for brook trout, *Salvelinus fontinalis*. In two replicate trails, trout ($\bar{x}$ TL = 18.6 cm) acclimated at 18 C and 23 C were exposed to temperature increases of 0.5 C/day until death. Lethal temperatures were significantly different (OC = 0.05) between acclimation temperatures. Temperatures at death ranged from 23.3 C to 26.6 C. The $LT_{50}$ for fish acclimated at 18 C and 23 C was 25.3 and 25.1 C, respectively. There was a 90.4% mortality of 23 C control fish; no mortality occurred in the 18 C control.

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[Southwest Tex. State Univ., San Marcos] Plasma corticosteroid concentratons of channel catfish increased significantly in response to a 24 h net confinement. Leucocrits of net confined fish decreased after 6 h of confinement. Blood cell differential counts indicated that, during the stress, lymphocyte counts decreased by 6 h of confinement and granulocyte counts increased by 12 h of confinement. The decrease in leucocrit at 6 h was attributed to the decrease in lymphocyte number and the increase of leucocrit at 12 h was attributed to the increase in granulocyte number.

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[Environ. Cent., Martin Marietta Crop., 1450 S. Rolling Rd., Baltimore, MD 21227] The food conversion efficiency of *Fundulus heteroclitus* (L.) was measured in terms of calories and nitrogen for three diets: *Palaemonetes* sp., *Nereis* sp., and *Uca pugnax*. Fish were allowed to feed ad libitum for 30-60 min each day. Growth, ingestion, egestion, and excretion were measured for fish fed each diet. The growth rates of *Fundulus heteroclitus* fed two of the single item diets of invertebrates were higher than growth rates previously estimated for mimmichogs from the natural population in Canary Creek marsh. In comparison with other fish species, *F. heteroclitus* was found to have higher than average assimilation efficiency ($\bar{X}$ = 87% for all three diets) and a lower than average

PHYSIOLOGY (CONTINUED)

82-001519 CONTINUED gross growth efficiency (~ 12% for two of the diets). Metabolic costs accounted for an average of 69% of ingested energy. Excretion rates were also large, with excretion accounting for more energy than egestion in two of the three diets.

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[Dep. Wildl. Fish. Sci., Tex. A&M Univ., College Station] Fifty-four brood size (greater than 250 mm) largemouth bass were live biopsied for removal of liver tissue to be used in electrophoretic evaluation of individual genetic status. These fish were subsequently stocked into six brood ponds for production of known intrasubspecific and intersubspecific genetic crosses. Spawning occurred in each pond indicating minimal effect of biopsy on spawning physiology. Forty-four fish were removed from the ponds at the termination of the experiment. All incisions were completely healed and condition of fish had improved over condition at time of stocking.

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82-001535 Loginova, G. A. and S. V. Krasnoperova. AN ATTEMPT AT CROSSBREEDING ATLANTIC SALMON AND PINK SALMON (PRELIMINARY REPORT). *Aquaculture* 27(4):329-337. May 1982. SFA 27(3)
[PINRO, Murmansk, USSR] The results of artificial crossbreeding of *Salmo salar* and *Oncorhynchus gorbuscha* of the Kola river (Murmansk region) are discussed. Observations are presented on developmental characteristics of the hybrid and the Atlantic salmon parent, as well as karyological data on hybrid and control embryos. Crosses of Atlantic salmon and pink salmon of the Kola river produced non-viable embryos with various morphological anomalies. The diploid chromotype of the hybrid ranged from 52 to 56. The number of two-armed chromosomes in the karyotype of the hybrid embryos was greater than that in the karyotype of Atlantic salmon. It is concluded that crosses of Atlantic salmon and pink salmon could not occur in nature.

82-001536 Lyons, B. W. SURVIVAL RATES OF THREE SUNFISH X LARGEMOUTH BASS HYBRIDS. *Annu. Proc. Tex. Chap. Am. Fish. Soc.* 4:4. 1981[1982]. Abstract only. SFA 27(3)
[Tex. Parks Wildl. Dep., Ingram 78025] Male redbreast sunfish (*Lepomis auritus*), redear sunfish (*L. microlophus*) and coppernose bluegill (*L. macrochirus purpurescens*) were crossed with largemouth bass (*Micropterus salmoides*). These sunfish were selected for their adult size. All crosses were artificially produced by hand-stripping the sex products into petri dishes. Survival to 60-mm fingerlings ranged from 0.00 to 3.13%. Many of the resulting hybrids were deformed. Based on low survival rates, none of the hybrids studied appear to be feasible for hatchery production.

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82-001538 Moyer, J. T. INTERSPECIFIC SPAWNING OF THE PYGMY ANGELFISHES *CENTROPYGE SHEPARDI* AND *CENTROPYGE BISPINOSUS* AT GUAM. *Micronesica* 17(1-2):119-124. Dec. 1981. SFA 27(3)
[Tatsuo Tanaka Mem. Biol. Stn., Ako Miyake-jima, Izu Islands, Japan 100-12]

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[Dep. Zool., Univ. Mont., Missoula 59812] Cutthroat trout from the Helena and the Lewis and Clark National Forests in the upper Missouri drainage are not genetically different from *S. c. lewisi* populations west of the Continental Divide. There is no indication that any taxonomic distinction should be made between upper Missouri cutthroat trout and other westslope cutthroat trout. The cutthroat trout (*S. c. lewisi*) on opposite sides of the Continental Divide in Montana are more similar to each other than either of them is to cutthroat trout (*S. c. lewisi*) populations in the South Saskatchewan River drainage. The amount of genetic variation in the upper Missouri cutthroat trout is low; average heterozygosity is only 0.001.

## GENETICS, VARIATION STUDIES AND HYBRIDIZATION (CONTINUED)

82-001541 Seeb, J. and L. Wishard. BIOCHEMICAL GENETIC ANALYSIS OF TWO STRAINS OF NEBRASKA RAINBOW TROUT. *Nebr. Game Parks Comm. Tech. Ser.* No. 7. p. 29-34. 1979. SFA 27(3)

This report genetically characterized the domestic and McConaughy strains of rainbow trout using the biochemical genetics and the technique of electrophoresis. The domestic and McConaughy strains have been shown to be genetically distinct. Not only are the allele frequencies different at 4 loci, but the domestic strain was overall more polymorphic than the McConaughy strain. The frequencies associated with the strains would remain constant through time, assuming no outside manipulation or drastic reduction in population numbers occurred. Thus the differences identified in this paper should provide useful management tools to identify, separate, and follow the progress of the McConaughy and domestic strains in Nebraska.--Concl.

82-001542 Shelton, W. L. PRODUCTION OF REPRODUCTIVELY LIMITED GRASS CARP FOR BIOLOGICAL CONTROL OF AQUATIC WEEDS--PHASE II. *Auburn Univ. Water Resour. Res. Inst. WRRI Bull.* 45. ix + 64p. Jan. 1982. SFA 27(3)

[Water Resour. Res. Inst., Auburn Univ., AL] Infestation of waterways with nuisance aquatic plants is a world-wide problem and the desirability of an effective biological control is increasingly evident considering the cost-effectiveness and environmental concerns associated with chemical means. The grass carp feeds on a wide variety of aquatic plants but opposition to the use of this exotic fish is largely on the basis of potential naturalization; control of unwanted reproduction would increase the acceptance of grass carp in the U.S. Monosexing through hormone sex reversal has been used in aquaculture as a means of preventing reproduction and was selected as the most practicable approach for grass carp. However, their specialized feeding habits complicated convential oral treatment, so an alternative method of steroid exposure was required. Functional sex reversal was used as a means of developing broodstock that, when bred would yield monosex progeny. Sex-reversed males (genotypic females) were bred in 1980 and 1981; of the approximately 500 offspring from the 1980 year class that have been sexed, all were females. Further, all gynogenetic grass carp that have been sexed have been females. Additional evaulation of the 1980 year class and sexing fish from the 1981 year class will be done. If these offspring are also only female, the program of monosexing by breeding can be considered practical application.

82-001543 Ståhl, G. and N. Ryman. SIMPLE MENDELIAN INHERITANCE AT A LOCUS CODING FOR $\alpha$-GLYCEROPHOSPHATE DEHYDROGENASE IN BROWN TROUT (*SALMO TRUTTA*). *Hereditas* 96(2):313-315. 1982. SFA 27(3)

[Dep. Genet., Univ. Stockholm, Box 6801, S-113 86 Stockholm, Sweden]

82-001544 Sumantadinata, K. and N. Taniguchi. BIOCHEMICAL GENETIC VARIATIONS IN BLACK SEABREAM. *Bull. Jpn. Soc. Sci. Fish.* 48(2):143-149. Feb. 1982. SFA 27(3)

[Dep. Cult. Fish., Fac. Agric., Kochi Univ., Nankoku, Kochi 783, Japan]

82-001545 Taniguchi, N.; K. Sumantadinata; A. Suzuki and J. Yamada. GENETIC VARIATIONS IN ISOELECTRIC FOCUSING PATTERN OF SARCOPLASMIC PROTEIN OF BLACK SEABREAM. *Bull. Jpn. Soc. Sci. Fish.* 48(2):139-141. Feb. 1982. SFA 27(3)

[Dep. Cult. Fish., Fac. Agric., Kochi Univ., Nankoku, Kochi 783, Japan]

## GENETICS, VARIATION STUDIES AND HYBRIDIZATION (CONTINUED)

82-001546 Yabu, H. and K. Ishii. NUCLEAR DIVISIONS IN PACIFIC POMFRET *BRAMA JAPONICA* HILGENDORF. *Bull. Jpn. Soc. Sci. Fish.* 48(4):505-507. Apr. 1982. SFA 27(3)

[Fac. Fish., Hokkaido Univ., Hakodate 041, Japan]

## BEHAVIOR

82-001547 Able, K. W.; C. B. Grimes; R. A. Cooper and J. R. Uzmann. BURROW CONSTRUCTION AND BEHAVIOR OF TILEFISH, *LOPHOLATILUS CHAMAELEONTICEPS*, IN HUDSON SUBMARINE CANYON. *Environ. Biol. Fishes* 7(3):199-205. 1 June 1982. SFA 27(3)

[Dep. Zool., Rutgers Univ., New Brunswick, NJ]

82-001548 Baylis, J. R. UNUSUAL ESCAPE RESPONSE BY TWO CYPRINODONTIFORM FISHES, AND A BLUEGILL PREDATOR'S COUNTER-STRATEGY. *Copeia* 1982(2):455-457. 28 May 1982. SFA 27(3)

[Dep. Zool., Univ. Wis., Madison 53706]

82-001549 Blumer, L. S. A BIBLIOGRAPHY AND CATEGORIZATION OF BONY FISHES EXHIBITING PARENTAL CARE. *Zool. J. Linn. Soc.* 75(1):1-22. May 1982. SFA 27(3)

[Div. Biol. Sci., Univ. Mich., Ann Arbor 48109] Parental care occurs in a diversity of fishes, but predominantly among freshwater groups. Among the approximately 422 families of bony fishes (Osteichthyes), 89 are presently known to exhibit parental care. Grouping these families into eight categories, based on the sex of the care-giver(s), reveals male parental care is as common or more common than female parental care. Although unusual among vertebrates, parental care by males alone is very common among bony fishes. Lists of families, the forms of parental care exhibited, the modes of fertilization, the environments in which reproduction occurs, and the sources of documentation are presented. An extensive bibliography and index are provided.

82-001550 Bradstreet, M. S. W. OCCURRENCE, HABITAT USE, AND BEHAVIOR OF SEABIRDS, MARINE MAMMALS, AND ARCTIC COD AT THE POND INLET ICE EDGE. *Arctic* 35(1):28-40. Mar. 1982. SFA 27(3)

[LGL Ltd., 44 Eglinton Ave. West, Toronto, ON M4R 1A1, Canada]

82-001551 Carey, F. G.; J. W. Kanwisher; O. Brazier; G. Gabrielson; J. G. Casey and H. L. Pratt, Jr. TEMPERATURE AND ACTIVITIES OF A WHITE SHARK, *CARCHARODON CARCHARIAS*. *Copeia* 1982(2):254-260. 28 May 1982. SFA 27(3)

[Woods Hole Oceanogr. Inst., Woods Hole, MA 02543] A large (4.6 m) white shark was followed for 3.5 days while its depth, water temperature and muscle temperature were recorded by acoustic telemetry. During this time the shark moved 190 km from an area south of Montauk Point, New York to Hudson Canyon. It made a number of brief excursions to the surface and to the bottom, but usually swam in the thermocline. Muscle temperature of the shark was as much as 5C warmer than the water, confirming that a system of large retia mirabilia in the circulatory system function as heat exchangers. The shark did not thermoregulate and muscle temperature changed slowly as water temperature changed. The warming of the muscle as the shark swam into warmer water allowed us to estimate its rate of metabolism. The rate obtained is low and despite being warm, it appears that the shark can maintain itself for

BEHAVIOR (CONTINUED)

82-001551 CONTINUED more than a month on a single large meal. The implications of this for its feeding habits are discussed.

82-001552 Clarke, L. A. MIGRATION AND ORIENTATION OF TWO STOCKS OF ATLANTIC SALMON (*SALMO SALAR* L.) SMOLTS. *Ph.D. dissertation, Univ. New Brunswick* 1981. From Diss. Abstr. Int. B Sci. Eng. 42(11):4276. May 1982. SFA 27(3)

82-001553 Coombs, S. and A. N. Popper. STRUCTURE AND FUNCTION OF THE AUDITORY SYSTEM IN THE CLOWN KNIFEFISH, *NOTOPTERUS CHITALA*. *J. Exp. Biol.* 97:225-239. Apr. 1982. SFA 27(3)
[Parmly Hearing Inst., Loyola Univ. Chicago, 6525 N. Sheridan Rd., Chicago, IL 60626]

82-001554 Downer, P. SCHOOLING BEHAVIOR OF YOUNG-OF-THE-YEAR TUI CHUB, *GILA BICOLOR* (GIRARD). *M.S. thesis, Univ. Nev. (Reno)* 138p. 1981. From Masters Abstr. 20(2):236. June 1982. SFA 27(3)
Schooling behavior of young-of-the-year tui chub, *Gila bicolor* (Girard), was investigated by photographing schools of 3, 5, 10 and 25 fish before and during feeding and interaction with a predator, a Lahontan cutthroat trout (*Salmo clarki henshawi*). Eight parameters quantifying the degree of compactness and/or degree of polorization of the schools were calculated for each photograph. An auxiliary study suggested that schooled fish show a slower and more variable growth rate than solitary fish.

82-001555 Dubin, R. E. and J. D. Baker. TWO TYPES OF COVER-SEEKING BEHAVIOR AT SUNSET BY THE PRINCESS PARROTFISH, *SCARUS TAENIOPTERUS*, AT BARBADOS, WEST INDIES. *Bull. Mar. Sci.* 32(2):572-583. Apr. 1982. SFA 27(3)
[Dep. Zool., Univ. Alberta, Edmonton, AB T6G 2E9, Canada]

82-001556 Eastman, J. T. and A. L. DeVries. BUOYANCY STUDIES OF NOTOTHENIOID FISHES IN MCMURDO SOUND, ANTARCTICA. *Copeia* 1982(2):385-393. 28 May 1982. SFA 27(3)
[Dep. Zool., Ohio Univ., Athens 45701]

82-001557 Eaton, R. C.; W. A. Lavender and C. M. Wieland. ALTERNATIVE NEURAL PATHWAYS INITIATE FAST-START RESPONSES FOLLOWING LESIONS OF THE MAUTHNER NEURON IN GOLDFISH. *J. Comp. Physiol. A Sens. Neural Behav. Physiol.* 145(4):485-496. 1 Mar. 1982. SFA 27(3)
[Behav. Biol. Group, Dep. Biol., E.P.O., Univ. Colo., Boulder 80309]

82-001558 Fay, R. R. NEURAL MECHANISMS OF AN AUDITORY TEMPORAL DISCRIMINATION BY THE GOLDFISH. *J. Comp. Physiol. A Sens. Neural Behav. Physiol.* 147(2):201-216. July 1982. SFA 27(3)
[Parmly Hearing Inst., Loyola Univ. Chicago, 6525 N. Sheridan Rd., Chicago, IL 60626]

BEHAVIOR (CONTINUED)

82-001559 Fontaine, M.; S. Jeanjean and A. Momzikoff. INTERVENTION POSSIBLE DE LA RIBOFLAVINE (VITAMINE $B_2$) COMME TÉLÉMÉDIATEUR CHIMIQUE DANS LES ÉCOSYSTÈMES AQUATIQUES. [POSSIBLE ACTION OF RIBOFLAVIN (VITAMIN $B_2$) AS A CHEMICAL TELEMEDIATOR IN AQUATIC ECOSYSTEMS.] *C.R. Hebd. Seances Acad. Sci. Ser. III Sci. Vie* 294(3):165-167. 18 Jan. 1982. In French with English summ. SFA 27(3)

[Lab. Physiol., Inst. Oceanogr., 195 rue Saint-Jacques, 75005 Paris, France] The attractive action of riboflavin at certain concentrations on the young Salmon (parr) has been demonstrated. This property diminishes or disappears with smoltifications. Owing to the emission of riboflavin by the young Salmon, the possibility, at diverse migratory or sedentary phases of the biological cycle, of an action of a pheromone or ecomone type, is discussed.

82-001560 Gascon, D. and R. A. Miller. SPACE UTILIZATION IN A COMMUNITY OF TEMPERATE REEF FISHES INHABITING SMALL EXPERIMENTAL ARTIFICIAL REEFS. *Can. J. Zool.* 60(5):798-806. May 1982. In English with French summ. SFA 27(3)

[Dep. Zool., Univ. Alberta, Edmonton, AB T6G 2E9, Canada]

82-001561 Giattina, J. D. and R. R. Garton. GRAPHICAL MODEL OF THERMOREGULATORY BEHAVIOR BY FISHES WITH A NEW MEASURE OF EURYTHERMALITY. *Can. J. Fish. Aquatic Sci.* 39(3):524-528. Mar. 1982. In English with French summ. SFA 27(3)

[U.S. EPA, Corvallis Environ. Res. Lab., Corvallis, OR 97333]

82-001562 Gradall, K. S. and W. A. Swenson. RESPONSES OF BROOK TROUT AND CREEK CHUBS TO TURBIDITY. *Trans. Am. Fish. Soc.* 111(3):392-395. May 1982. SFA 27(3)

[Cent. Lake Superior Environ. Stud., Univ. Wis., Superior 54880]

82-001563 Grillner, S. and P. Wallén. ON PERIPHERAL CONTROL MECHANISMS ACTING ON THE CENTRAL PATTERN GENERATORS FOR SWIMMING IN THE DOGFISH. *J. Exp. Biol.* 98:1-22. June 1982. SFA 27(3)

[Dep. Physiol. III, Karolinska Inst., Lidingövägen I, S-114 33 Stockholm, Sweden]

82-001564 Hailman, J. P. CONCEALMENT BY STRIPES DURING MOVEMENT AND BARS AT REST: FIELD EVIDENCE FROM COLOR CHANGES IN A GOATFISH AND A CORONETFISH. *Copeia* 1982(2):454-455. 28 May 1982. SFA 27(3)

[Dep. Zool., Univ. Wis., Madison 53706]

82-001565 Hoffman, C. J. ASSOCIATIONS BETWEEN THE ARROW GOBY *CLEVELANDIA IOS* (JORDAN AND GILBERT) AND THE GHOST SHRIMP *CALLIANASSA CALIFORNIENSIS* DANA IN NATURAL AND ARTIFICIAL BURROWS. *Pac. Sci.* 35(3):211-216. July 1981. SFA 27(3)

[Univ. Oreg., Oreg. Inst. Mar. Biol., Charleston 97420] *Clevelandia ios* is a small estuarine teleost that inhabits the burrows of the Thalassinid crustacean *Callianassa californiensis*. Field observations and laboratory experiments were undertaken to determine the relationship of *Clevelandia ios* and *Callianassa californiensis*, whether it be commensalism, mutualism, or parasitism. *Clevelandia ios* and *Callianassa californiensis* were found to co-occur in burrows less frequently than they would be expected to by chance, under both field and laboratory conditions.

BEHAVIOR (CONTINUED)

82-001565 CONTINUED In addition, the arrow gobies were found to inhabit the ghost shrimp burrows only during the spring and summer months.

82-001566 Jones, K. A. THE ROLE OF TEMPERATURE IN THE RESPONSE BY GOLDFISH (*CARASSIUS AURATUS*) TO CHEMICAL CUES. *Ph.D. dissertation, Tex. A&M Univ.* 136p. 1981. From Diss. Abstr. Int. B Sci. Eng. 42(10):3918. Apr. 1982. SFA 27(3)

82-001567 Kavaliers, M. ENDOGENOUS LUNAR RHYTHM IN THE BEHAVIOURAL THERMOREGULATION OF A TELEOST FISH, THE WHITE SUCKER, *CATOSTOMUS COMMERSONI*. *J. Interdisipl. Cycle Res.* 13(1):23-27. Feb. 1982. SFA 27(3)
[Dep. Zool., Univ. West. Ontario, London, ON N6A 5B7, Canada] The white sucker, *Catostomus commersoni*, displays a diel rhythm of behavioural thermoregulation in a horizontal thermal gradient. Under LD 12:12 single fish select significantly higher temperatures in the scotophase than in the photophase. An endogenous lunar rhythm exists in the absolute and maximum and minimum temperatures selected. Significantly higher temperatures (+2°C) are selected at the times of the new moon than at the times of the full moon. This provides the first demonstration of an endogenous lunar rhythm in the thermoregulatory behaviour of a vertebrate.

82-001568 Kavaliers, M. SEASONAL AND CIRCANNUAL RHYTHMS IN BEHAVIORAL THERMOREGULATION AND THEIR MODIFICATIONS BY PINEALECTOMY IN THE WHITE SUCKER, *CATOSTOMUS CONNERSONI*. *J. Comp. Physiol. A Sens. Neural Behav. Physiol.* 146(2):235-243. Apr. 1982. SFA 27(3)
[Dep. Zool., Univ. West. Ontario, London, ON N6A 5B7, Canada]

82-001569 Kennedy, G. J. A. and C. D. Strange. THE DISTRIBUTION OF SALMONIDS IN UPLAND STREAMS IN RELATION TO DEPTH AND GRADIENT. *J. Fish Biol.* 20(5):579-591. May 1982. SFA 27(3)
[Fish. Res. Lab., Dep. Agric. North. Ireland, 38 Costleroe Rd., Coleraine, Co. Londonderry, Northern Ireland] The distribution of various age classes of salmon and trout was assessed in upland streams by electrofishing. Water depths and site gradients were measured and correlated to fish densities. The fry of both species were significantly more abundant in shallow water; up to 75.3% of salmon fry and 72.2% of trout fry were captured in sites of mean depth <20 cm. Older trout were found mainly in the deeper areas, with a maximum of 7.4% captured in sites <20cm mean depth. Yearling fish were found in all the depth-ranges sampled, but with a tendency for higher numbers in mid-range depths. There were similar correlations in the abundance of each age class with the actual areas of shallow, mid-range and deep water habitat available within sites. Correlations of fish density with gradient indicated that trout were limited in their distribution to areas of lower flow, whereas salmon were not. Since depth and gradient were significantly negatively correlated, there was an apparent preference of trout for slightly deeper habitats than the equivalent year classes of salmon. The observed habitat segregation is discussed in terms of competition and selection.

82-001570 Kentouri, M. and P. Divanach. DIFFERENCES ET SIMILITUDES DANS LA GENESE DES COMPORTEMENTS LOCOMOTEUR ET TROPHIQUE DES STADES PRELARVAIRES DE *SPARUS AURATUS, DIPLODUS VULGARIS* ET *DIPLODUS SARGUS*. [DIFFERENCES AND SIMILARITIES IN THE GENESIS OF THE LOCOMOTOR AND TROPHIC BEHAVIOUR OF THE PRELARVAL STAGES OF *SPARUS AURATUS, DIPLODUS VULGARIS* AND *DIPLODUS SARGUS*.] *Aquaculture* 27(4):355-376. May 1982. In French with English

## BEHAVIOR (CONTINUED)

82-001570 CONTINUED summ. SFA 27(3)
[Stn. Biol. Mar. Lagunaire, Quai de Bosc Prolongé, 34200 Sète, France] The behaviour of the prelarval stages of *Sparus auratus*, *Diplodus vulgaris* and *Diplodus sargus* was studied in 570-1 tanks at a temperature of 19°C. The different stages in swimming from hatching to the age of 4 days are as follows; period of dominating immobility (1st day); passive vertical migration (2nd day); first oblique swimming (3rd day); first horizontal swimming (4th day). The different speeds of swimming and the distances covered are calculated; the specific differences are mentioned. The predation training period is described and food selectivity at this stage is demonstrated. Aquacultural implications are discussed.

82-001571 Lane, E. B. and M. Whitear. SENSORY STRUCTURES AT THE SURFACE OF FISH SKIN. I. PUTATIVE CHEMORECEPTORS. *Zool. J. Linn. Soc.* 75(2):141-151. June 1982. SFA 27(3)
[M. Whitear: Dep. Zool., Univ. Coll., Gower St., London WC1E 6BT, England]

82-001572 Le Martret, M.-A. and P. Saglio. COMMUNICATION INTRASPECIFIQUE D'ORIGINE PHÉROMONALE CHEZ LE CARASSIN DORÉ IMMATURE, *CARASSIUS AURATUS* L. I. MISE EN ÉVIDENCE OLFACTOMÉTRIQUE DU PHÉNOMÈNE. [THE ROLE OF PHEROMONES IN INTRASPECIFIC COMMUNICATION IN IMMATURE GOLDFISH, *CARASSIUS AURATUS* L. I. OLFACTOMETRIC DEMONSTRATION.] *Biol. Behav.* 7(1):41-54. 1982. In French with English summ. SFA 27(3)
[Lab. Physiol. Poissons, I.N.R.A., C.N.R.Z., F78350 Jouy-en-Josas, France] Olfactometric observations on immature goldfish (*Carassius auratus*) recieving water from a tank that held conspecifics pointed out the occurence of pheromonal communication not related to reproductive behavior in this species. Compared with the controls receiving only dechlorinated tap water, the grouping tendency is in all cases studied significantly increased while the attractivity of the effluent varies according to the density considered. The highest attractivity is observed with 10 goldfish held 24h in 25 l of water at 20°C. For 30 fish held in the same conditions we observe some repulsive effect. The value of these first results is discussed and hypotheses on the nature and origin of the chemicals involved are presented.

82-001573 Martini, F. H. and K. Welch. A REPORT ON A NONFATAL SHARK ATTACK IN THE HAWAIIAN ISLANDS. *Pac. Sci.* 35(3):237-240. July 1981. SFA 27(3)
[P.O. Box 207, Lahaina, Maui, HI 96761]

82-001574 Meyer, J. H. BEHAVIORAL RESPONSES OF WEAKLY ELECTRIC FISH TO COMPLEX IMPEDANCES. *J. Comp. Physiol. A Sens. Neural Behav. Physiol.* 145(4):459-470. 1 Mar. 1982. SFA 27(3)
[Scripps Inst. Oceanogr., A-002, La Jolla, CA 92093]

82-001575 Ogilvie, D. M. BEHAVIORAL RESPONSE OF GOLDFISH (*CARASSIUS AURATUS*) TO DEOXYGENATED WATER. *Copeia* 1982(2):434-439. 28 May 1982. SFA 27(3)
[Dep. Zool., Univ. West. Ontario, London, ON N6J 5B7, Canada]

82-001576 Ogilvy, C. S. and A. B. DuBois. TAIL THRUST OF BLUEFISH *POMATOMUS SALTATRIX* AT DIFFERENT BUOYANCIES, SPEEDS, AND SWIMMING ANGLES. *J. Exp. Biol.* 98:105-117. June 1982. SFA 27(3)
[John B. Pierce Found. Lab., 290 Congress Ave., New Haven, CT 06519]

BEHAVIOR (CONTINUED)

82-001577 Pavlov, D. S. and L. G. Shtaf. DISTRIBUTION OF DOWNSTREAM-MIGRANT JUVENILE FISH IN A RHEOGRADIENT STREAM. *Dokl. Biol. Sci. (Engl. Transl. Dokl. Akad. Nauk SSSR Ser. Biol.)* 260(1-6):445-448. Mar. 1982. SFA 27(3)
[A. N. Severtsov Inst. Evol. Morphol. Ecol. Anim., Acad. Sci. USSR, Moscow, USSR]

82-001578 Peters, H. M. and S. Berns. DIE MAULBRUTPFLEGE DER CICHLIDEN. UNTERSUCHUNGEN ZUR EVOLUTION EINES VERHALTENSMUSTERS. [MOUTH-BROODING IN CICHLIDS. A STUDY OF THE EVOLUTION OF A BEHAVIOUR PATTERN.] *Z. Zool. Syst. Evolutionsforsch.* 20(1):18-52. Mar. 1982. In German with English summm. SFA 27(3)
[Inst. Biol. III Univ., Lehrstuhl Zoophysiol., Abt. Verhaltensphysiol., Bein Kepferhammer 8, D-7400 Tübingen 1, West Germany]

82-001579 Quinn, T. P. COMPASS ORIENTATION OF JUVENILE SOCKEYE SALMON (*ONCORHYNCHUS NERKA*). *Ph.D. dissertation, Univ. Wash.* 98p. 1981. From Diss. Abstr. Int. B Sci. Eng. 42(12):4709. June 1982. SFA 27(3)

82-001580 Sivak, J. G. OPTICAL CHARACTERISTICS OF THE EYE OF THE FLOUNDER. *J. Comp. Physiol. A Sens. Neural Behav. Physiol.* 146(3):345-349. May 1982. SFA 27(3)
[Sch. Optom., Univ. Waterloo, Waterloo, ON N2L 3G1, Canada]

82-001581 Smith, R. J. F. REACTION OF *PERCINA NIGROFASCIATA, AMMOCRYPTA BEANI*, AND *ETHEOSTOMA SWAINI* (PERCIDAE, PISCES) TO CONSPECIFIC AND INTERGENERIC SKIN EXTRACTS. *Can. J. Zool.* 60(5):1067-1072. May 1982. IN English with French summ. SFA 27(3)
[Biol. Dep., Univ. Saskatchewan, Saskatoon, SK 57N 0W0, Canada]

82-001582 Sosiak, A. J. BUOYANCY COMPARISONS BETWEEN JUVENILE ATLANTIC SALMON AND BROWN TROUT OF WILD AND HATCHERY ORIGIN. *Trans. Am. Fish. Soc.* 111(3):307-311. May 1982. SFA 27(3)
[Resour. Dep., Montreal Eng. Co., Ltd., 900 125-9th Ave. SE, Calgary, AB T2G 0P6, Canada]

82-001583 Thomas, G. L. LOCATION AND ENUMERATION OF THE PELAGIC SCHOOLING FISHES ALONG THE CONTINENTAL SHELF BREAK. *Proc. Annu. Conf. West. Assoc. Fish Wildl. Agencies* 61:20. 1981. Abstract only. SFA 27(3)

82-001584 Vancil, R.; G. Zuerlein and L. Hesse. LETHAL AND PREFERRED TEMPERATURES OF LAKE MCCONAUGHY RAINBOW TROUT VERSUS DOMESTIC STRAIN RAINBOW TROUT. *Nebr. Game Parks Comm. Tech. Ser.* No. 7. p. 4-20. 1979. SFA 27(3)
[Investigations were conducted in 1978 to determine the temperature tolerance and preference of the McConaughy strain rainbow trout and make comparisons with a domestic strain. Lethal and preferred temperature tests were performed in the laboratory on both strains. Critical thermal maxima tests were conducted in the field on the McConaughy strain. The ultimate upper lethal temperature for the McConaughy strain was determined to be approximately 27°C while that for the domestic strain was slightly less than 26°C. The final preferenda for the McConaughy and domestic strains were 16.4 to 16.7°C and 16.9 to 17.2°C, respectively. A difference in mean ages of the

BEHAVIOR (CONTINUED)

82-001584 CONTINUED two strains probably influenced temperature selection. The mean monthly critical thermal maxima for the McConaughy strain fish ranged from 30.6 to 32.7°C and increased throughout the season (April to August). It appears that high temperature generally should not be a critical limiting factor for rainbow trout fingerlings in the North Platte Valley tributary streams.

82-001585 Videler, J. J. and D. Weihs. ENERGETIC ADVANTAGES OF BURST-AND-COAST SWIMMING OF FISH AT HIGH SPEEDS. *J. Exp. Biol.* 97:169-178. Apr. 1982. SFA 27(3)

[Dep. Zool., Groningen State Univ., P.O. Box 14, 9750 AA Haren, Netherlands] A theoretical model describes how an intermittent swimming style can be energetically advantageous over continuous swimming at high average velocities. Kinematic data are collected from high-speed ciné pictures of free swimming cod and saithe at high velocities in a burst-and-coast style. These data suggest that fish make use of the advantages shown by choosing initial and final burst velocities close to predicted optimal values. The limiting role of rapid glycogen depletion in fast white anaerobic muscle fibres is discussed.

82-001586 Wakeman, J. M. and D. E. Wohlschlag. SWIMMING CAPABILITIES OF SPOTTED SEATROUT. *Annu. Proc. Tex. Chap. Am. Fish. Soc.* 4:35-52. 1981[1982]. SFA 27(3)

[Dep. Zool., La. Tech Univ., Ruston 71272]

82-001587 Watanabe, M. and Y. Tamoto. THE MOTIVATION OF CARE FOR OFFSPRINGS IN THE CICHLID *SAROTHERODON MOSSAMBICUS*. *Proc. Jpn. Acad. Ser. B Phys. Biol. Sci.* 57(7):266-270. Sept. 1981. SFA 27(3)

[Dep. Biol., Coll. Liberal Arts Sci., Okayama, Japan]

82-001588 Webb, P. W. AVOIDANCE RESPONSES OF FATHEAD MINNOW TO STRIKES BY FOUR TELEOST PREDATORS. *J. Comp. Physiol. A Sens. Neural Behav. Physiol.* 147(3):371-378. July 1982. SFA 27(3)

[Sch. Nat. Resour., Univ. Mich., Ann Arbor 48109] Predator avoidance behavior of fathead minnow (*Pimephales promelas*) attacked by four teleosts (tiger musky, *Esox* sp; rainbow trout, *Salmo gairdneri*; smallmouth bass, *Micropterus dolomieu*; rock bass, *Ambloplites rupestris*) was analyzed using stop-action video-tape recordings of predator-prey interactions. The predators represented a range of body forms. 75 to 90% of minnows responded to strikes by trout, bass and rock bass, but only 28% responded to strikes by tiger musky. Responses were 54 to 94% successful in evading a strike. Two prey avoidance response patterns were found. Type-1 responses were low intensity, non-sustained turning maneuvers away from more distant and more slowly moving predators. Type-2 responses were high intensity turning maneuvers followed by sustained swimming away from closer and faster-moving predators. All responses to tiger musky were type-2 responses. Prey speeds in avoidance responses were lower for rock bass than for the other three predators. Response thresholds for fathead minnow escape maneuvers were calculated at the start of the motor response, and evaluated with respect to predator size. Predator size was calculated from the dimensions of the silhouette viewed by the prey as the mean of predator depth and width. Prey reaction distance decreased and predator visual angle increased with predator size for trout, bass and rock bass. Reaction distance was smaller, and visual angle larger for responses to tiger musky. The rates of change of the visual angle at the start of a response, the apparent looming threshold (ALT), were similar for trout, bass and rock bass, but 15-80 times larger for tiger musky. The results suggest that

## BEHAVIOR (CONTINUED)

82-001588 CONTINUED configuration differences between the predators are important contributors to the stimulus initiating avoidance responses. It is suggested that the rounded body cross-section of esocids is associated with higher response thresholds than elliptical and lenticular cross-sections of trout, bass and rock bass.

**82-001589** **Wynes, D. L. and T. E. Wissing. RESOURCE SHARING AMONG DARTERS IN AN OHIO STREAM. Am. *Midl. Nat*. 107(2):294-304. Apr. 1982. SFA 27(3)**
[Dep. Environ. Sci., Nichols Coll., Dudley, MA 01570] This study quantified predator-prey interactions involving three darter species (*Etheostoma caeruleum*, *E. zonale* and *E. blennioides*) and macroinvertebrates of the upper Little Miami River, Ohio, and the extent of seasonal food and habitat partitioning among these fishes. Food overlap values (Cλ) based on biomass were generally lower than those computed from the numbers of prey items in the annual diets (Cλ = 0.41-0.75 and 0.72-0.84, respectively). These differences reflected size-selective feeding behavior and variability in the dry weights of food organisms. Feeding intensity was influenced by water temperature, while the contributions of the various invertebrate taxa to the diets shifted with changes in the abundances of these forms. *Etheostoma zonale* and *E. blennioides* selected food items in the size ranges of 1-5 and 1-6 mm, respectively; the range for *E. caeruleum* was 1-9 mm. Darter numbers in the riffles changed seasonally in response to the timing of reproduction. These shifts resulted in low overlap values (Cλ = 0.41-0.44) based on habitat use. We concluded that the darters coexist through resource sharing which reduces interspecific competition for food and space.

## LIFE HISTORY-GENERAL WORKS

**82-001590** **Baltz, D. M. and P. B. Moyle. LIFE HISTORY CHARACTERISTICS OF TULE PERCH (*HYSTEROCARPUS TRASKI*) POPULATIONS IN CONTRASTING ENVIRONMENTS. *Environ. Biol. Fishes* 7(3):229-242. 1 June 1982. SFA 27(3)**
[Dep. Wildl. Fish. Biol., Univ. Calif., Davis 95616] The life history characteristics of tule perch were compared within and among populations in three drainages with substantially different environmental conditions. Within populations there were, in general, substantial increases in brood size, size of young, brood weight, and gonadal-somatic index (GSI) with age and with size of female. In at least one population there was a trade-off between the number and size of young produced. However, in a lake where individual growth was very slow, brood weight, GSI, and other life history characters showed decreasing trends with age. Among populations in isolated drainages, female length at first reproduction and longevity varied directly and mean brood size varied inversely with environmental predictability. Morphological and geological evidence and some comparative litter characteristics suggest that life history differences among populations in isolated drainages are in part genetic.

**82-001591** **Craig, P. C.; W. B. Griffiths; L. Haldorson and H. McElderry. ECOLOGICAL STUDIES OF ARCTIC COD (*BOREOGADUS SAIDA*) IN BEAUFORT SEA COASTAL WATERS, ALASKA. *Can. J. Fish. Aquatic Sci.* 39(3):395-406. Mar. 1982. In English with French summ. SFA 27(3)**
[LGL Ltd., Environ. Res. Assoc., Suite 333, 2453 Beacon Ave., Sidney, BC V8L 1X7, Canada]

## LIFE HISTORY-GENERAL WORKS (CONTINUED)

82-001592 Frank, K. T. and W. C. Leggett. ENVIRONMENTAL REGULATION OF GROWTH RATE, EFFICIENCY, AND SWIMMING PERFORMANCE IN LARVAL CAPELIN (*MALLOTUS VILLOSUS*), AND ITS APPLICATION TO THE MATCH/MISMATCH HYPOTHESIS. *Can. J. Fish. Aquatic Sci.* 39(5):691-699. 1982. In English with French summ. SFA 27(3)
[Dep. Biol., McGill Univ., 1205 Ave. Docteur Penfield, Montreal, PQ H3A 1B1, Canada]

82-001593 George, T. T. THE CHINESE GRASS CARP, *CTENOPHARYNGODON IDELLA*, ITS BIOLOGY, INTRODUCTION, CONTROL OF AQUATIC MACROPHYTES AND BREEDING IN THE SUDAN. *Aquaculture* 27(3):317-327. Apr. 1982. SFA 27(3)
[Fish. Res. Cent., Agric. Res. Corp., Khartoum, Sudan]

82-001594 Martinez, G. J. A STUDY OF AGE, GROWTH, AND FOOD HABITS OF CERTAIN GAME FISHES IN CORDELL HULL RESERVOIR, TENNESSEE. *Tenn. Tech J.* 16:67. 1981. Abstract only. SFA 27(3)
[Tenn. Tech Univ., Cookeville 38501]

82-001595 McKee, P. M. and B. J. Parker. THE DISTRIBUTION, BIOLOGY, AND STATUS OF THE FISHES *CAMPOSTOMA ANOMALUM*, *CLINOSTOMUS ELONGATUS*, *NOTROPIS PHOTOGENIS* (CYPRINIDAE), AND *FUNDULUS NOTATUS* (CYPRINODONTIDAE) IN CANADA. *Can. J. Zool.* 60(6):1347-1358. June 1982. SFA 27(3)
[Beak Consultants Ltd., 6870 Goreway Dr., Mississauga, ON, L4V 1P1 Canada]

82-001596 Minami, T. [THE EARLY LIFE HISTORY OF A FLOUNDER *PLEURONICHTHYS CORNUTUS*.] *Bull. Jpn. Soc. Sci. Fish.* 48(3):369-374. Mar. 1982. In Japanese with English summ. SFA 27(3)
[Dep. Fish., Fac. Agric., Kyoto Univ., Kyoto 606, Japan]

82-001597 Palko, B. J.; G. L. Beardsley and W. J. Richards. SYNOPSIS OF THE BIOLOGICAL DATA ON DOLPHIN-FISHES, *CORYPHAENA HIPPURUS* LINNAEUS AND *CORYPHAENA EQUISELIS* LINNAEUS. *NOAA Tech. Rep. NMFS Circ.* 443. iv + 28p. Apr. 1982. SFA 27(3)
[NMFS, 3500 Delwood Beach Rd., Panama City, FL 32407]

82-001598 Sakai, M. and A. Goto. [STUDIES ON THE FRESHWATER FISH IN HOKKAIDO, JAPAN--I. BREEDING HABITS, GROWTH AND DISTRIBUTION OF A GOBY, *CHAENOGOBIUS CASTANEA* (O'SHAUGHNESSY).] *Bull. Fac. Fish. Hokkaido Univ.* 33(1):9-23. Mar. 1982. In Japanese with English summ. SFA 27(3)
[Grad. Sch. Environ. Sci., Univ. Tsukuba, Japan]

82-001599 Seagle, H. H., Jr. and J. W. Nagel. LIFE CYCLE AND FECUNDITY OF THE AMERICAN BROOK LAMPREY, *LAMPETRA APPENDIX*, IN TENNESSEE. *Copeia* 1982(2):362-366. 28 May 1982. SFA 27(3)
[Ill. Nat. Hist. Surv., Pool 26 River Res. Lab., Grafton 62037] American brook lampreys, *Lampetra appendix* were collected from Buffalo and North Indian creeks in northeastern Tennessee. Length/frequency data indicate that the larval period lasts at least 4½ years and possibly more. Adults live one-half year; thus, the minimum life span is 5 years. Spawning occurs in March and external signs of metamorphosis begin in August and continue through October. The mean ovarian follicle estimate for gravid females was 2,883 and the sex ratio was 1.2 M:1 F, not significantly different from 1:1.

LIFE HISTORY-GENERAL WORKS (CONTINUED)

82-001600 Sekerak, A. D. YOUNG-OF-THE-YEAR COD (*BOREOGADUS*) IN LANCASTER SOUND AND WESTERN BAFFIN BAY. *Arctic* 35(1):75-87. Mar. 1982. SFA 27(3)
[LGL Ltd., 2453 Beacon Ave., Sidney, BC V8L 1X7, Canada]

82-001601 Stacey, N. E. and A. S. Hourston. SPAWNING AND FEEDING BEHAVIOR OF CAPTIVE PACIFIC HERRING, *CLUPEA HARENGUS PALLASI*. *Can. J. Fish. Aquatic Sci.* 39(3):489-498. Mar. 1982. In English with French summ. SFA 27(3)
[Dep. Zool., Univ. Alberta, Edmonton, AB T6G 2E9, Canada]

82-001602 Stribley, J. A. and R. H. Stasiak. AGE, GROWTH, AND FOOD HABITS OF THE PLAINS TOPMINNOW, *FUNDULUS SCIADICUS* COPE, IN KEITH COUNTY, NEBRASKA. *Proc. Nebr. Acad. Sci. Affil. Soc.* 92:17-18. 1982. Abstract only. SFA 27(3)
[Dep. Biol., Univ. Nebr., Omaha 68182]

82-001603 Thorson, T. B. LIFE HISTORY IMPLICATIONS OF A TAGGING STUDY OF THE LARGETOOTH SAWFISH, *PRISTIS PEROTTETI*, IN THE LAKE NICARAGUA-RÍO SAN JUAN SYSTEM. *Environ. Biol. Fishes* 7(3):207-228. 1 June 1982. SFA 27(3)
[Sch. Life Sci., Univ. Nebr., Lincoln 68588-0118]

82-001604 Tung, I.-H. [ON THE FISHERY BIOLOGY OF THE GREY MULLET, *MUGIL CEPHALUS* LINNAEUS, IN TAIWAN.] *Rep. Inst. Fish. Biol. Minist. Econ. Aff. Natl. Taiwan Univ.* 3(4):38-102. Dec. 1982. In Chinese with English summ. SFA 27(3)
[Inst. Fish. Biol., Natl. Taiwan Univ., Taipei, Taiwan, China]

82-001605 Walsh, S. J. and B. M. Burr. DISTRIBUTION, MORPHOLOGY AND LIFE HISTORY OF THE LEAST BROOK LAMPREY, *LAMPETRA AEPYPTERA* (PISCES: PETROMYZONTIDAE), IN KENTUCKY. *Brimleyana* 6:83-100. Dec. 1981. SFA 27(3)
[Dep. Zool., South. Ill. Univ., Carbondale 62901]

82-001606 Wang, J. C. S. EARLY LIFE HISTORY AND PROTECTION OF THE TIDEWATER GOBY *EUCYCLOGOBIUS NEWBERRYI* (GIRARD) IN THE RODEO LAGOON OF THE GOLDEN GATE NATIONAL RECREATION AREA. *Univ. Calif. (Davis) Inst. Ecol. Tech. Rep.* No. 7. iii + 24p. Apr. 1982. SFA 27(3)
[23 Mountair Court, Clayton, CA 94517]

82-001607 Westhaus, P. FISCHEREIBIOLOGISCHE UNTERSUCHUNGEN AM GOLDLACHS (*ARGENTINA SILUS*) IM SEEGEBIET DER SHETLAND-FÄRÖER-INSELN UND IN IN GEWÄSSERN WESTLICH GROßBRITANNIENS. [BIOLOGICAL INVESTIGATIONS ON *ARGENTINA SILUS* IN THE AREA OF THE SHETLAND-FAROE-ISLANDS AND WEST OF GREAT BRITAIN.] *Arch. Fischereiwiss.* 32(1-3):13-28. Apr. 1982. In German with English summ. SFA 27(3)
[Inst. Hydrobiol. Fischereiwiss., Univ. Hamburg, Hamburg, West Germany]

82-001608 Williams, J. S. LIFE HISTORY ASPECTS OF THE BROWN DARTER, *ETHEOSTOMA EDWINI* (PISCES: PERCIDAE), IN NORTHWEST FLORIDA. *M.S. thesis, Univ. West Fla.* 48p. 1981. From Masters Abstr. 20(2):132. June

## LIFE HISTORY-GENERAL WORKS (CONTINUED)

82-001608 CONTINUED 1982. SFA 27(3)
Life history aspects of *Etheostoma edwini* were studied in Pond Creek, Santa Rosa County, Florida from July 1974 to April 1975, and in March 1976. The preferred habitat of *E. edwini* was found to be aquatic vegetation in flowing water. As evidenced by gonadal condition, spawning ended in early fall in 1974 and began again in midwinter in 1975, but was delayed until spring in 1976. Spawning activity was apparently temperature regulated. Age-group 1 fish were sexually mature. Spawning position ranged from vertical to inverted in an aquarium, and eggs were laid on vegetation. Larvae from aquarium spawnings hatched an average of 6.5 days after egg fertilization. In nature males grew faster than females. The male-female sex ratio was 1:2. Most individuals lived two years, with highest mortality occurring in spring. The diet of *E. edwini* consisted almost entirely of aquatic insects and crustaceans. Most individuals were parasitized by a digenetic trematode of the genus *Crepidostomum*.

82-001609 Wood, R. J. THE THAMES ESTUARY HERRING STOCK. *Fish. Res. Tech. Rep. Minist. Agric. Fish. Food (Lowestoft)* No. 64. 21p. 1981. SFA 27(3)
[Minist. Agric. Fish. Food, Lowestoft, England]

82-001610 Zuerlein, G. THE WHITE PERCH, *MORONE AMERICANA* (GMELIN) IN NEBRASKA. *Nebr. Game Parks Comm. Tech. Ser.* No. 8. 108p. 1981. SFA 27(3)
Available from Nebr. Game Parks Comm., P.O. Box 30370, Lincoln 68503.

## POPULATION STUDIES, PRODUCTION, RECRUITMENT, ETC.

82-001611 Argyle, R. L. ALEWIVES AND RAINBOW SMELT IN LAKE HURON: MIDWATER AND BOTTOM AGGREGATIONS AND ESTIMATES OF STANDING STOCKS. *Trans. Am. Fish. Soc.* 111(3):267-285. May 1982. SFA 27(3)
[U.S. FWS, Great Lakes Fish. Lab., 1451 Green Rd., Ann Arbor, MI 48105]

82-001612 Bailey, R. S. THE POPULATION BIOLOGY OF BLUE WHITING IN THE NORTH ATLANTIC. *Adv. Mar. Biol.* 19:257-355. 1982. SFA 27(3)
[Dep. Agric. Fish. Scotland, Mar. Lab., Aberdeen, Scotland]

82-001613 Beard, T. D. POPULATION DYNAMICS OF YOUNG-OF-THE-YEAR BLUEGILL. *Wis. Dep. Nat. Resour. Tech. Bull.* No. 127. 32p. 1982. SFA 27(3)
[Wis. Dep. Nat. Resour., Box 397, 1341 2nd Ave., Cumberland 54829] Factors influencing bluegill year class strength were evaluated in 3 small, winterkill lakes in northern Wisconsin during 1971-76. Only bluegill were present during the 1st 4 years of the study while walleye and other warm water species were added in 2 of the lakes during 1975-76. The density of parent bluegill was doubled in the remaining lake and no other species added during this latter study segment. When no other species were present, the most important single variables affecting year class strength were size of parent females and date of 1st fry dispersal from the nest, the latter indicating that spawning beginning after the 1st week in July resulted in a weak year class. Water temperatures below 21 C also had an important impact on year class strength by interupting or postponing spawning and slowing development of eggs and fry although no correlation was found between June water temperatures and standing crop of fall fingerlings. Daily mortality was much higher during the 4-day period following fry dispersal from the nest than during other life history stages, suggesting that year class strength

## POPULATION STUDIES, PRODUCTION, RECRUITMENT, ETC. (CONTINUED)

82-001613 CONTINUED may be set at this time. Doubling the number of parent bluegill did not increase the number of fingerlings present in the fall although fry production increased. Increased fry production was also apparent when walleye and other warm water species were stocked, but fingerling production was sharply decreased. Where walleye were present, predation was determined to be the primary factor in the decrease. Young bluegill were insignificant food items of the other warm water species. However, low level predation by yellow perch fingerlings may have had a significant impact on bluegill numbers in 1 study year although other, unknown, forms of competition are also thought to have been involved. Reduction of bluegill numbers by pumping fry from the nest and by selective chemical treatment of the limnetic area of a lake are discussed.

82-001614 Borgmann, U. PARTICLE-SIZE-CONVERSION EFFICIENCY AND TOTAL ANIMAL PRODUCTION IN PELAGIC ECOSYSTEMS. *Can. J. Fish. Aquatic Sci.* 39(5):668-674. May 1982. In English with French summ. SFA 27(3)
[Can. Cent. Inland Waters, Burlington, ON L7R 4A6, Canada]

82-001615 Ciepielewski, W. POPULATION OF PIKE (*ESOX LUCIUS* L.) IN POND TYPE LAKE WARNIAK IN 1969-1978. *Ekol. Pol.* 29(1):35-51. 1981. In English with Polish summ. SFA 27(3)
[Inland Fish. Inst., 10-957 Olsztyn, Kortowo, Poland] Maximum catches in 1969-1978 were 23 kg/ha/yr, whereas the minimum catches were less than 1 kg/ha/yr. The mean weight of caught fish was the highest in the years of minimal catches. Usually 2-3 years old individuals were caught. Virtual populations were from several hundreds to over 2200 individuals. In 1977 the virtual pike population decreased to 74 individuals. The biomass of pike in 1969-1976 ranged between 10 and 40.6 kg/ha/yr, and of production--between 6.6 to 41.2 kg/ha/yr. The sex ratio in dominant age groups in the population was 1:1.

82-001616 Craig, J. F. A NOTE ON GROWTH AND MORTALITY OF TROUT, *SALMO TRUTTA* L., IN AFFERENT STREAMS OF WINDERMERE. *J. Fish Biol.* 20(4):423-429. Apr. 1982. SFA 27(3)
[Freshwater Biol. Assoc., Windermere Lab., Ambleside, Cumbria, England] Trout were sampled in six afferent streams of Windermere during the spawning season. The main migration of adult trout into the streams took place during early November. Length-weight relationships and scale-fish length relationships are given. There was no significant difference in length for age or sex between cohorts within streams. Three groups of fish could be identified depending on whether the fish entered the lake at 1+,2+, or 3+ years. The percentage number of the population entering the lake at each of these ages was 16, 70 and 14%, respectively. After the fish had migrated from the streams their growth in length fitted the von Bertalanffy growth model. Fish entering the lake at 1+ and 2+ years had similar $A_{.95}$ values (6.31 and 6.97 years) as the latter grew slightly faster in the lake. Those entering the lake at 3+ years grew at a slower rate to the other two groups but achieved a longer ultimate length. Faster growing fish had higher instantaneous mortality rates. Twenty-eight to 29% of the males remaining in the stream at 1+ years became sexually mature. Faster growing females became sexually mature earlier. Only those fish which entered the lake at 1+ years grew close, during their early years before sexual maturity, to the theoretical maximum given by Elliott's model.

82-001617 Flain, M. QUINNAT SALMON RUNS, 1965-78, IN THE GLENARIFFE STREAM, RAKAIA RIVER, NEW ZEALAND. *N.Z. Minist. Agric. Fish. Occas. Publ.* No. 28. 22p. 1982. SFA 27(3)

## POPULATION STUDIES, PRODUCTION, RECRUITMENT, ETC. (CONTINUED)

82-001618 Loftus, D. H. LARVAL FISH SAMPLING IN LAKE HURON, 1978. *Ontario Fish. Tech. Rep. Ser.* No. 2. iii + 12p. 1982. SFA 27(3)
[Ontario Minist. Nat. Resour., Fish. Br., Queen's Park, Toronto, ON M7A 1W3, Canada]

82-001619 McGregor, A. J. and S. L. Marshall. ORIGINS OF CHUM SALMON (*ONCORHYNCHUS KETA*) IN THE EXCURSION INLET PURSE SEINE FISHERY OF 1981 BASED ON SCALE PATTERN ANALYSIS. *Alaska Dep. Fish Game Inf. Leafl.* No. 201. iv + 34p. June 1982. SFA 27(3)
[Alaska Dep. Fish Game, Div. Commer. Fish., Juneau]

82-001620 Ralston, S. V. D. A STUDY OF THE HAWAIIAN DEEPSEA HANDLINE FISHERY WITH SPECIAL REFERENCE TO THE POPULATION DYNAMICS OF OPAKAPAKA, *PRISTIPOMOIDES FILAMENTOSUS* (PISCES: LUTJANIDAE). *Ph.D. dissertation, Univ. Wash.* 222p. 1981. From Diss. Abstr. Int. B Sci. Eng. 42(12):4671. June 1982. SFA 27(3)

82-001621 Vaughan, D. S. and W. Van Winkle. CORRECTED ANALYSIS OF THE ABILITY TO DETECT REDUCTIONS IN YEAR-CLASS STRENGTH OF THE HUDSON RIVER WHITE PERCH (*MORONE AMERICANA*) POPULATION. *Can. J. Fish. Aquatic Sci.* 39(5):782-785. May 1982. In English with French summ. SFA 27(3)
[Environ. Sci. Div., Oak Ridge Natl. Lab., Oak Ridge, TN 37830]

82-001622 Viljanen, M. and I. J. Holopainen. POPULATION DENSITY OF PERCH (*PERCA FLUVIATILIS* L.) AT EGG, LARVAL AND ADULT STAGES IN THE DYS-OLIGOTROPHIC LAKE SUOMUNJÄRVI, FINLAND. *Ann. Zool. Fenn.* 19(1):39-46. 1982. SFA 27(3)
[Karelian Inst., Sect. Ecol., Univ. Joensuu, Box 111, 80101 Joensuu 10, Finland] Between 1974 and 1977 the population density of perch at egg, larval and adult stages in the dys-oligotrophic Lake Suomunjärvi, eastern Finland, was studied quantitatively. In addition, data on fecundity, age, growth, size distribution and biomass were gathered. The density of eggs deposited on the bottom was calculated from egg clusters sampled quantitatively by a scuba-diver. This gave a mean density of 320,000 eggs/ha at the 0-3 depth zone, with only low variation between years, sites and depths. Larvae about one week old were sampled quantitatively with the Clarke-Bumpus and CalCoFi net samplers. The results obtained with the latter, which gave much higher densities (mean 6,850 larvae/ha) than the former (2,850/ha), are considered more reliable because of the larger mouth area of the sampler and the higher number of larvae caught. To estimate the adult population density, a scuba-diver counted the fish directly and the reliability of the method was established by comparing the diver's estimation with that given using a capture-mark-recapture method in a small isolated bay. The mean population density of perch of three years or older was 312 ind./ha. The survival in the total populations of the lake was 8% from deposited eggs to one week old larvae and 0.05% from eggs to three year old fish.

## SPAWNING HABITS AND MOVEMENTS, FECUNDITY, ETC.

82-001623 Balon, E. K. ABOUT THE COURTSHIP RITUALS IN FISHES, BUT ALSO ABOUT A FALSE SENSE OF SECURITY GIVEN BY CLASSIFICATION SCHEMES, 'COMPREHENSIVE' REVIEWS AND COMMITTEE DECISIONS. *Environ. Biol. Fishes*

## SPAWNING HABITS AND MOVEMENTS, FECUNDITY, ETC. (CONTINUED)

82-001623 CONTINUED 7(3):193-197. 1 June 1982. SFA 27(3)
[Dep. Zool., Coll. Biol. Sci., Univ. Guelph, Guelph, ON N1G 2W1, Canada]

82-001624 Beacham, T. D. **FECUNDITY OF COHO SALMON (*ONCORHYNCHUS KISUTCH*) AND CHUM SALMON (*O. KETA*) IN THE NORTHEAST PACIFIC OCEAN.** *Can. J. Zool.* 60(6):1463-1469. June 1982. SFA 27(3)
[Dep. Fish. Oceans, Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada] Significant regional and annual variability in fecundity of coho salmon (*Oncorhynchus kisutch*) and chum salmon (*O. keta*) in British Columbia was detected during this investigation. A Kodiak Island (Alaska) coho salmon stock was more fecund than southern stocks in British Columbia and Washington. Fecundity ranged from 2450 to 2850 eggs per female at 53.6 cm postorbital-hypural length for Vancouver Island stocks to over 4400 eggs per female for a Kodiak Island stock at the same length. Chum stocks on Vancouver Island and the Queen Charlotte Islands generally had fecundities less than 3200 eggs per female at 58.8 cm postorbital-hypural length, whereas chum of equal lengths in mainland British Columbia stocks ranged from 3200 to 3450 eggs per female. Older chum and coho were usually more fecund than younger ones, but this difference could be accounted for by differences in mean length-at-age, fecundity being related to body size.

82-001625 Bronstein, P. M. **BREEDING, PATERNAL BEHAVIOR, AND THEIR INTERRUPTION IN *BETTA SPLENDENS*.** *Anim. Learn. Behav.* 10(2):145-151. May 1982. SFA 27(3)
[Dep. Psychol., Univ. Mich., Flint 48503]

82-001626 Coates, D. **SOME OBSERVATIONS ON THE SEXUALITY OF HUMBUG DAMSELFISH, *DASCYLLUS ARUANUS* (PISCES, POMACENTRIDAE) IN THE FIELD.** *J. Comp. Ethol.* 59(1):7-18. 1982. SFA 27(3)
[Dep. Primary Ind. Fish. Res. Surv., P.O. Box 417, Konedobu, Papua New Guinea]

82-001627 Coyer, J. A. **OBSERVATIONS ON THE REPRODUCTIVE BEHAVIOR OF THE GIANT KELPFISH, *HETEROSTICHUS ROSTRATUS* (PISCES: CLINIDAE).** Copeia 1982(2):244-250. 28 May 1982. SFA 27(3)
[Catalina Mar. Sci. Cent., Box 398, Avalon, CA 90704]

82-001628 Crabtree, R. E. and D. P. Middaugh. **OYSTER SHELL SIZE AND THE SELECTION OF SPAWNING SITES BY *CHASMODES BOSQUIANUS*, *HYPLEUROCHILUS GEMINATUS*, *HYPSOBLENNIUS IONTHAS* (PISCES, BLENNIIDAE) AND *GOBIOSOMA BOSCI* (PISCES, GOBIIDAE) IN TWO SOUTH CAROLINA ESTUARIES.** *Estuaries* 5(2):150-155. June 1982. SFA 27(3)
[Va. Inst. Mar. Sci., Gloucester Point 23062] Utilization of empty oyster shells as a habitat and spawning substrate by the naked goby, *Gobiosoma bosci*, the striped blenny, *Chasmodes bosquianus*, crested blenny, *Hypleurochilus geminatus*, and freckled blenny, *Hypsoblennius ionthas*, was studied in the North Inlet and North Edisto River estuaries of South Carolina. Gape and length of shells occupied by fishes were measured. Fish inhabited and spawned in only a small portion of the size range of shells available. *G. bosci*, the smallest species studied, spawned in shells with narrower gapes than did *C. bosquianus* or *H. geminatus* and in shorter shells than did *C. bosquianus*. Thus, *G. bosci* may escape competition

## SPAWNING HABITS AND MOVEMENTS, FECUNDITY, ETC. (CONTINUED)

82-001628 CONTINUED for spawning sites. Overall, there was a positive correlation between fish length and both gape and length of shells occuped by egg-guarding males.

82-001629 Crapon de Caprona, M.-D. THE INFLUENCE OF EARLY EXPERIENCE ON PREFERENCES FOR OPTICAL AND CHEMICAL CUES PRODUCED BY BOTH SEXES IN THE CICHLID FISH *HAPLOCHROMIS BURTONI* (*ASTATOTILAPIA BURTONI*, GREENWOOD 1979). *J. Comp. Ethol.* 58(4):329-361. Apr. 1982. In English with German summ. SFA 27(3)

[Fak. Biol., Univ. Bielefeld, Postfach 8640, D-4800 Bielefeld 1, West Germany]

82-001630 MacDonald, C. D. REPRODUCTIVE STRATEGIES AND SOCIAL ORGANIZATION IN DAMSELFISHES. *Ph.D. dissertation, Univ. Hawaii* 241p. 1981. From Diss. Abstr. Int. B Sci. Eng. 42(12):4708. June 1982. SFA 27(3)

82-001631 Matsumiya, Y.; T. Mitani and M. Tanaka. CHANGES IN DISTRIBUTION PATTERN AND CONDITION COEFFICIENT OF THE JUVENILE JAPANESE SEA BASS WITH THE CHIKUGO RIVER ASCENDING. *Bull. Jpn. Soc. Sci. Fish.* 48(2):129-138. Feb. 1982. SFA 27(3)

[Fac. Fish., Nagasaki Univ., Nagasaki 852, Japan]

82-001632 Nakatsuru, K. and D. L. Kramer. IS SPERM CHEAP? LIMITED MALE FERTILITY AND FEMALE CHOICE IN THE LEMON TETRA (PISCES, CHARACIDAE). *Science* 216(4547):753-755. 14 May 1982. SFA 27(3)

[Dep. Biol., McGill Univ., 1205 Ave. Docteur Penfield, Montreal, PQ H3A 1B1, Canada] In the laboratory, fertilization rates achieved by male lemon tetras decline with spawning frequency. Even when the number of females is not limited, males can produce only four times as many offspring as females. Females show a preference for males that have not recently spawned as opposed to those that have. The cost of producing sufficient sperm to maximize fertilization rates may therefore reduce the intensity of sexual selection in this polygamous fish species.

82-001633 Sargent, R. C. SEXUAL SELECTION AND REPRODUCTIVE EFFORT IN THE THREESPINE STICKLEBACK, *GASTEROSTEUS ACULEATUS*. *Ph.D. dissertation, State Univ. N.Y. (Stony Brook)* 97p. 1981. From Diss. Abstr. Int. B Sci. Eng. 42(12):4672. June 1982. SFA 27(3)

82-001634 Swain, A. THE MIGRATIONS OF SALMON (*SALMO SALAR* L.) FROM THREE RIVERS ENTERING THE SEVERN ESTUARY. *J. Cons. Cons. Int. Explor. Mer* 40(1):76-80. Feb. 1982. SFA 27(3)

[Salmon Freshwater Fish. Lab., Whitehall Place East, London SW1A 2HH, England] Over a 7-year period more than 50,000 smolts were tagged in the Rivers Usk, Wye, and Severn. A total of 228 of these fish was subsequently recaptured: 19 were taken at West Greenland; 3 were taken in British waters away from the Bristol Channel; and a further 100 fish were taken in tidal waters in the Severn estuary and Bristol Channel area. Of the remaining 106 salmon recaptured above tidal limits in home waters, 97(92%) were in their parent rivers, while 9(8%) had strayed to the freshwater reaches of other rivers.

## MOVEMENTS, SEASONAL AND DEPTH DISTRIBUTION, ETC.

82-001635 Bracken, B. E. SABLEFISH (*ANOPLOPOMA FIMBRIA*) MIGRATION IN THE GULF OF ALASKA BASED ON GULF-WIDE TAG RECOVERIES, 1973-1981. *Alaska Dep. Fish Game Inf. Leafl.* No. 199. iv + 24p. Apr. 1982. SFA 27(3)
[Alaska Dep. Fish Game, Div. Commer. Fish., P.O. Box 667, Petersburg 99833]

82-001636 Brown, L. and J. F. Downhower. SUMMER MOVEMENTS OF MOTTLED SCULPINS, *COTTUS BAIRDI* (PISCES: COTTIDAE). *Copeia* 1982(2):450-453. 28 May 1982. SFA 27(3)
[Dep. Biol., George Mason Univ., Fairfax, VA 22030]

82-001637 Hartman, G. F.; B. C. Andersen and J. C. Scrivener. SEAWARD MOVEMENT OF COHO SALMON (*ONCORHYNCHUS KISUTCH*) FRY IN CARNATION CREEK, AN UNSTABLE COASTAL STREAM IN BRITISH COLUMBIA. *Can. J. Fish. Aquatic Sci.* 39(4):588-597. Apr. 1982. In English with French summ. SFA 27(3)
[Dep. Fish. Oceans, Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada]

82-001638 Lenarz, W. H. MOVEMENTS OF ROCKFISH AND THEIR IMPLICATIONS FOR STOCK ASSESSMENT AND MANAGEMENT. *Proc. Annu. Conf. West. Assoc. Fish Wild. Agencies* 61:27. 1981. Abstract only. SFA 27(3)

82-001639 Matsushita, K.; M. Shimizu and Y. Nose. MICRO-DISTRIBUTION OF ANCHOVY EGGS AND LARVAE IN SAGAMI BAY. *Bull. Jpn. Soc. Sci. Fish.* 48(3):355-362. Mar. 1982. SFA 27(3)
[Dep. Fish., Fac. Agric., Univ. Tokyo, 1-1, Yayoi-1, Bunkyo, Tokyo 113, Japan]

82-001640 Mayama, H.; M. Kato; J. Seki and I. Shimizu. [STUDIES ON THE CHUM SALMON RELEASED IN THE ISHIKARI RIVER SYSTEM - I. ON THE SEAWARD MIGRATION AND INSHORE DISTRIBUTIONS OF LIBERATED FRY IN 1979.] *Sci. Rep. Hokkaido Salmon Hatchery* No. 36. p. 1-17. Mar. 1982. In Japanese with English summ. SFA 27(3)
[Hokkaido Salmon Hatchery, Nakanoshima, Toyohiraku, Sapporo, Hokkaido, Japan]

82-001641 Thorne, R. E. STUDIES OF JUVENILE SALMON DISTRIBUTION AND BEHAVIOR IN AN ESTUARINE ENVIRONMENT. *Proc. Annu. Conf. West. Assoc. Fish Wildl. Agencies* 61:21-26. 1981. SFA 27(3)
[Fish. Res. Unit, Univ. Wash., Seattle]

## FOODS/FEEDING

82-001642 Angermeier, P. L. RESOURCE SEASONALITY AND FISH DIETS IN AN ILLINOIS STREAM. *Environ. Biol. Fishes* 7(3):251-264. 1 June 1982. SFA 27(3)
[Dep. Ecol. Ethol. Evol., Univ. Ill., 606 E. Healey, Champaign 61820]

FOODS/FEEDING (CONTINUED)

82-001643 Ashton, C. E. THE RESPONSE OF PINFISH (*LAGODON RHOMBOIDES*) TO CRYPTIC AND NON-CRYPTIC FLOUNDER (*PARALICHTHYS ALBIGUTTA*). *M.S. thesis, Univ. West. Fla.* 54p. 1980. From Masters Abstr. 20(2):130. June 1982. SFA 27(3)

Observations made on the feeding behavior of *Paralichthys albigutta* indicated that this flounder utilizes an "ambush" method of prey capture while preying on pinfish. To further examine this predator-prey interaction, pinfish were exposed to substrate (i.e., shade) adapted and non-adapted flounder and flounder models. Pinfish avoided models, but not live flounder, that contrasted with the substrate in a directional (180 degrees opposite the models) and distance (distance from the model) predicted manner. Further analysis of live flounder data indicated that pinfish avoided the head area of live flounder that contrast with the shade of the substrate. The study suggests that pinfish may be unable to detect and avoid cryptically shaded flounder in the field, but it is not clear whether this indicates lack of experience with flounder or inability to perceive cryptically shaded flounder.

82-001644 Bartell, S. M. INFLUENCE OF PREY ABUNDANCE ON SIZE-SELECTIVE PREDATION BY BLUEGILLS. *Trans. Am. Fish. Soc.* 111(4):453-461. July 1982. SFA 27(3)
[Environ. Sci. Div., Oak Ridge Natl. Lab., Oak Ridge, TN 37830]

82-001645 Barton, M. G. INTERTIDAL VERTICAL DISTRIBUTION AND DIETS OF FIVE SPECIES OF CENTRAL CALIFORNIA STICHAEOID FISHES. *Calif. Fish Game* 68(3):174-182. July 1982. SFA 27(3)
[Div. Sci. Math., Centre Coll. Ky., Danville 40422]

82-001646 Białokoz, W. and T. Kryzywosz. FEEDING INTENSITY OF SILVER CARP (*HYPOPHTHALNICHTHYS MOLITRIX* VAL.) FROM THE PAPROTECKIE LAKE IN THE ANNUAL CYCLE. *Ekol. Pol.* 29(1):53-61. 1981. SFA 27(3)
[Lake Fish. Stn., Inland Fish. Inst., Rajska 2, 11-500 Giżycko, Poland] The amounts of food consumed by silver carp introduced to eutrophic Paproteckie Lake were investigated. The period of food passage, diurnal and periodical food rations, fish increments and feeding coefficients were determined. Annual food consumption was estimated as 8.8 kg, 90% of which was in the three warmest months in the year. Weight increase of fish approximated the average one for the region. Feeding coefficient was about 19, fluctuating between 7.9 and 24.6.

82-001647 Britton, R. H. and M. E. Moser. SIZE SPECIFIC PREDATION BY HERONS AND ITS EFFECT ON THE SEX-RATIO OF NATURAL POPULATIONS OF THE MOSQUITO FISH *GAMBUSIA AFFINIS* BAIRD AND GIRARD. *Oecologia (Berl.)* 53(2):146-151. May 1982. SFA 27(3)
[Stn. Biol., Tour Valat, Le Sambuc, F-13200 Arles, France]

82-001648 Cockran, P. A. and I. R. Adelman. SEASONAL ASPECTS OF DAILY RATION AND DIET OF LARGEMOUTH BASS, *MICROPTERUS SALMOIDES*, WITH AN EVALUATION OF GASTRIC EVACUATION RATES. *Environ. Biol. Fishes* 7(3):265-275. 1 June 1982. SFA 27(3)
[Lab. Limnol., Univ. Wis., Madison 53706] Sample of stomach contents collected on 10 dates from May to October, 1978, were used to describe the diet and estimate the daily ration of subadult largemouth bass (primarily age-III fish) in Lake Rebecca, Minnesota. The method of Elliott & Persson (1978) was used to estimate daily ration. Data from sources in the literature

FOODS/FEEDING (CONTINUED)

82-001648 CONTINUED were used to quantify gastric evacuation, which was found to be adequately described by an exponential decay model. The exponent of gastric evacuation increased exponentially with temperature. Seasonal changes in the diet with respect to composition, distribution of food among stomachs, and food particle size were reflected in the seasonal pattern of growth. Weight gain and the formation of scale annuli did not occur until the diet shifted from large bluegills and insects to age-0 largemouth bass and bluegills. Estimates of daily ration ranged from almost zero in mid-May and early June to over 5% in late August. The use of median weights of stomach contents was found to yield more meaningful estimates of the daily rations of individual bass than those based on means. Estimates based on medians were consistent with the observed pattern of growth and with information on maintenance rations and satiation levels. A growth-limiting lack of suitably-sized forage fish apparently occurred in the early part of the growing season.

82-001649 Du Buit, M. H. ESSAI D'ÉVALUATION DE LA PRÉDATION DE QUELQUES TÉLÉOSTÉENS EN MER CELTIQUE. [EVALUATION OF PREDATION OF SOME TELEOSTS IN THE CELTIC SEA.] *J. Cons. Cons. Int. Explor. Mer* 40(1):37-46. Feb. 1982. SFA 27(3)

[Cent. Natl. Rech. Sci., Lab. Biol. Mar., 29 182 Concarneau, France] Predation by six teleosts (hake, haddock, pollack, whiting, cod, and megrim) in two zones of the Celtic Sea was assessed by a method based on the composition and weight of their stomach contents and the commercial landings. Annual landings of 67,000 tonnes are equivalent to a consumption of 166,000 tonnes of prey, and four species--blue whiting, Norway pout, poor cod, and sprat--accounted for 81% of the total.

82-001650 Emmett, R. L.; W. D. Muir and R. D. Pettit. DEVICE FOR INJECTING PRESERVATIVE INTO THE STOMACH OF FISH. *Prog. Fish-Cult.* 44(2):107-108. Apr. 1982. SFA 27(3)

[NMFS, 2725 Montlake Blvd. East, Seattle, WA 98112]

82-001651 Fausch, K. D. COMPETITION AMONG JUVENILES OF COHO SALMON, BROOK AND BROWN TROUT FOR RESOURCES IN STREAMS. *Ph.D. dissertation, Mich. State Univ.* 111p. 1981. From Diss. Abstr. Int. B Sci. Eng. 42(12):4669. June 1982. SFA 27(3)

Results indicate that age-0 brook and brown trout could not gain advantageous stream positions in the face of competition from age-0 coho salmon even if the coho were of equal size. In streams where they occur together, juveniles of coho are larger than those of brook and brown trout, which gives the coho an even greater competitive advantage. Instream cover that affords visual isolation may somewhat ameliorate the competitive disadvantage of brook and brown trout in Great Lakes tributaries where coho salmon reproduce.--From abstr.

82-001652 Garman, G. C. and L. A. Nielsen. PISCIVORITY BY STOCKED BROWN TROUT (*SALMO TRUTTA*) AND ITS IMPACT ON THE NONGAME FISH COMMUNITY OF BOTTOM CREEK, VIRGINIA. *Can. J. Fish. Aquatic Sci.* 39(6):862-869. June 1982. In English with French summ. SFA 27(3)

[Me. Coop. Fish. Res. Unit, Univ. Me., Orono 04473

82-001653 Gilliland, E. R.; C. W. Kleinholz and M. D. Clady. THE EFFICIENCY OF REMOVING FOOD ITEMS FROM FISH WITH GLASS TUBES. *Annu. Proc. Tex. Chap. Am. Fish. Soc.* 4:95-100. 1981[1982]. SFA 27(3)

## FOODS/FEEDING (CONTINUED)

82-001653 CONTINUED
[Okla. Coop. Fish. Res. Unit, Okla. State Univ., Stillwater 74078] The stomach contents of live striped bass (*Morone saxatilis*), white bass (*M. chrysops*), striped bass x white bass hybrids, largemouth bass (*Micropterus salmoides*), and white crappie (*Pomoxis annularis*) were examined and removed using glass tubes. This technique removed more than 90% of the food by weight or volume from all species except white crappie. We removed shad (*Dorosoma* spp.), sunfishes (*Lepomis* spp.), inland silversides (*Menidia beryllina*), crayfish, benthic invertebrates, zooplankton, and adult and larval insects from the species studied. This technique is fast, efficient, and usually does not require sacrificing the fish.

82-001654 Hogue, E. W. SEASONAL CHANGE IN THE ABUNDANCE AND SPATIAL DISTRIBUTION OF A MEIOBENTHIC ASSEMBLAGE ON THE OPEN OREGON COAST AND ITS RELATIONSHIP TO THE DIET OF 0-AGE FLATFISHES. *Ph.D. dissertation, Oreg. State Univ.* 132p. 1982. From Diss. Abstr. Int. B Sci. Eng. 42(10):3913. Apr. 1982. SFA 27(3)

82-001655 Irvine, J. R. and T. G. Northcote. SIGNIFICANCE OF SEQUENTIAL FEEDING PATTERNS OF JUVENILE RAINBOW TROUT IN A LARGE LAKE-FED RIVER. *Trans. Am. Fish. Soc.* 111(4):446-452. July 1982. SFA 27(3)
[Dep. Zool., Univ. Otago, Dunedin, New Zealand]

82-001656 Lucas, J. R. FEEDING ECOLOGY OF THE GULF SILVERSIDE, *MENIDIA PENINSULAE*, NEAR CRYSTAL RIVER, FLORIDA, WITH NOTES ON ITS LIFE HISTORY. *Estuaries* 5(2):138-144. June 1982. SFA 27(3)
[Dep. Zool., Univ. Fla., Gainesville 32611] Feeding habits of *Menidia peninsulae* were analyzed monthly over a one year period and compared to planktonic prey available at the capture site. Three feeding stages were found: (1) In early spring, young-of-the-year fed on tychoplankton and detritus. (2) From late spring through winter, *M. peninsulae* preyed selectively on calanoid copepods and cypris larvae. (3) Gravid *M. peninsulae* fed primarily on amphipods and larval silversides. In the Crystal River area, *M. peninsulae* reproduce in early spring. Silversides apparently migrate from the higher salinity bays to the lower salinity marshes in the summer, and then move back into the bays in fall.

82-001657 McComas, S. R. and R. W. Drenner. SPECIES REPLACEMENT IN A RESERVOIR FISH COMMUNITY: SILVERSIDE FEEDING MECHANICS AND COMPETITION. *Can. J. Fish Aquatic Sci.* 39(6):815-821. June 1982. In English with French summ. SFA 27(3)
[WAPORA Inc., 35 East Wacker Dr., Suite 490, Chicago, IL 60601]

82-001658 Moore, J. A. and G. H. Winters. GROWTH PATTERNS IN A NEWFOUNDLAND ATLANTIC HERRING (*CLUPEA HARENGUS HARENGUS*) STOCK. *Can. J. Fish. Aquatic Sci.* 39(3):454-461. Mar. 1982. In English with French summ. SFA 27(3)
[Dep. Fish Oceans, P.O. Box 5667, St. Johns, NF A1C 5X1, Canada]

82-001659 Pearre, S., Jr. ESTIMATING PREY PREFERENCE BY PREDATORS: USES OF VARIOUS INDICES, AND A PROPOSAL OF ANOTHER BASED ON $\chi^2$. *Can. J. Fish. Aquatic Sci.* 39(6):914-923. June 1982. In English with French summ. SFA

FOODS/FEEDING (CONTINUED)

82-001659 CONTINUED 27(3)
[Dep. Oceanogr., Dalhousie Univ., Halifax, NS B3H 4J1, Canada]

82-001660 Power, M. E. THE GRAZING ECOLOGY OF ARMORED CATFISH (LORICARIIDAE) IN A PANAMANIAN STREAM. *Ph.D. dissertation, Univ. Wash.* 284p. 1981. From Diss. Abstr. Int. B Sci. Eng. 42(12):4709. June 1982. SFA 27(3)

82-001661 Ringler, N. H. and J. H. Johnson. DIET COMPOSITION AND DIEL FEEDING PERIODICITY OF SOME FISHES IN THE ST. LAWRENCE RIVER. *N.Y. Fish Game J.* 29(1):65-74. Jan. 1982. SFA 27(3)
[Sch. Biol. Chem. Ecol., State Univ. N.Y. Coll. Environ. Sci. For., NY] The diets of 901 fish representing nine species, collected in the St. Lawrence River at Cape Vincent and Massena from July to October 1976, were examined. Fish were gill netted at 4-hour intervals at depths of 5 and 10 meters. Amphipods appeared to be a major prey of many adult fish (e.g., yellow perch, rock bass, alewife, white sucker and brown bullhead). Cladocerans were the most important zooplankton taken by planktivorous fishes (i.e., alewife and gizzard shad). Invertebrate eggs represented nearly 67 per cent of the diet of yellow perch in July. Feeding periodicity of yellow perch and rock bass was similar to that reported for a lake in the Province of Ontario. However, diel patterns of yellow perch and alewife at a depth of 5 meters appeared to differ from those at 10 meters.

82-001662 Ross, J. L. FEEDING HABITS OF THE GRAY TILEFISH, *CAULOLATILUS MICROPS* (GOODE AND BEAN, 1878) FROM NORTH CAROLINA AND SOUTH CAROLINA WATERS. *Bull. Mar. Sci.* 32(2):448-454. Apr. 1982. SFA 27(3)
[Dep. Wildl. Fish. Sci., Tex. A&M Univ., College Station 77843]

82-001663 Savino, J. F. and R. A. Stein. PREDATOR-PREY INTERACTION BETWEEN LARGEMOUTH BASS AND BLUEGILLS AS INFLUENCED BY SIMULATED, SUBMERSED VEGETATION. *Trans. Am. Fish. Soc.* 111(3):255-266. May 1982. SFA 27(3)
[Ohio Coop. Fish. Res. Unit, Ohio State Univ., Columbus 43210]

82-001664 Savitz, J. and J. Janssen. UTILIZATION OF GREEN SUNFISH AND BLUEGILLS BY LARGEMOUTH BASS: INFLUENCE OF INGESTION TIME. *Trans. Am. Fish. Soc.* 111(4):462-464. July 1982. SFA 27(3)
[Biol. Dep., Loyola Univ. Chicago, Chicago, IL 60626]

82-001665 Savitz, J. TROPHIC DIVERSITY AND FOOD PARTITIONING AMONG FISHES ASSOCIATED WITH AQUATIC MACROPHYTE PATCHES. *Trans. Ill. State Acad. Sci.* 74(3-4):111-120. 1981. SFA 27(3)
[Biol. Dep., Loyola Univ. Chicago, 6525 N. Sheridan Rd., Chicago, IL 60626] Contents of 573 stomachs were examined for five fish species (largemouth bass, yellow perch, warmouth, bluegill, and pumpkinseed) collected among macrophyte patches. Trophic diversities and food overlap coefficients were calculated so that competitive interactions could be identified for further study. The largemouth bass, the bluegill, and the pumpkinseed were classed as food specialists and had low food overlap coefficients between them. There appeared to be little competition between the largemouth bass and either the bluegill or the pumpkinseed, but some competition between the bluegill and pumpkinseed may have existed for caddisflies. The yellow perch and the warmouth had high food overlap coefficients with each other as well as with other species and both exhibited a large trophic diversity. They were classified as food generalists.

FOODS/FEEDING (CONTINUED)

82-001666 Schmidt, D. and W. J. O'Brian. PLANKTIVOROUS FEEDING ECOLOGY OF ARCTIC GRAYLING (*THYMALLUS ARCTICUS*). *Can. J. Fish. Aquatic Sci.* 39(3):475-482. Mar. 1982. In English with French summ. SFA 27(3)
[L.G.L. Alaska Res. Assoc., P.O. Box 80607, Fairbanks 98708]

82-001667 Sibbing, F. A. PHARYNGEAL MASTICATION AND FOOD TRANSPORT IN THE CARP (*CYPRINUS CARPIO* L.): A CINERADIOGRAPHIC AND ELECTROMYOGRAPHIC STUDY. *J. Morphol.* 172(2):223-258. May 1982. SFA 27(3)
[Exp. Anim. Morphol. Cell Biol., Agric. Univ., Marijkeweg 40, 6709 PG Wageningen, Netherlands]

82-001668 Stillwell, C. E. and N. E. Kohler. FOOD, FEEDING HABITS, AND ESTIMATES OF DAILY RATION OF THE SHORTFIN MAKO (*ISURUS OXYRINCHUS*) IN THE NORTHWEST ATLANTIC. *Can. J. Fish. Aquatic Sci.* 39(3):407-414. Mar. 1982. In English with French summ. SFA 27(3)
[NMFS, Narragansett Lab., Narragansett, RI 02882]

82-001669 Strauss, R. E. INFLUENCE OF REPLICATED SUBSAMPLES AND SUBSAMPLE HETEROGENEITY ON THE LINEAR INDEX OF FOOD SELECTION. *Trans. Am. Fish. Soc.* 111(4):517-522. July 1982. SFA 27(3)
[Div. Fishes, Mus. Zool., Univ. Mich., Ann Arbor 48109]

82-001670 Tallman, R. F. and J. H. Gee. INTRASPECIFIC RESOURCE PARTITIONING IN A HEADWATERS STREAM FISH, THE PEARL DACE *SEMOTILUS MARGARITA* (CYPRINIDAE). *Environ. Biol. Fishes* 7(3):243-249. 1 June 1982. SFA 27(3)
[Dep. Zool., Univ. Manitoba, Winnipeg, MB R3T 2N2, Canada] Pearl dace, *Semotilus margarita*, are common in slow-moving channels and pools of the headwaters of the Brokenhead River. From May to September age groups 0, 1 and 2+ were partially segregated in space based on water depth with age 0 occupying shallow pools and shallow channels. Age 1 were abundant in shallow pools and deep channels while age 2+ occurred in deep channels and deep pools. In November all age groups coexisted in deep pools. Pearl dace are omnivorous consuming invertebrates, plant material, and detritus. From May to September age groups 0 and 1 consumed mainly terrestrial invertebrates (Diptera, Hymenoptera, Thysanoptera) but age 1 consumed more detritus than age 0. Age 2+ consumed mainly aquatic Diptera larvae. Although all ages consumed aquatic insects almost exclusively in November differences in diet between age groups still existed. Younger fish fed higher in the water column than older fish. Intraspecific resource partitioning of food and space occurs between age groups and this combined with the omnivorous diet is highly adaptive to the headwaters of streams.

82-001671 Weisberg, S. B. FOOD AVAILABILITY AND UTILIZATION BY THE MUMMICHOG, *FUNDULUS HETEROCLITUS* (L.). *Ph.D. dissertation, Univ. Del.* 118p. 1981. From Diss. Abstr. Int. B Sci. Eng. 42(11):4295. May 1982. SFA 27(3)

82-001672 Wright, D. E. and A. Eastcott. OPERANT CONDITIONING OF FEEDING BEHAVIOUR AND PATTERNS OF FEEDING IN THICK LIPPED MULLET, *CRENIMUGIL LABROSUS* (RISSO) AND COMMON CARP, *CYPRINUS CARPIO* (L.). *J. Fish Biol.* 20(6):625-634. June 1982. SFA 27(3)
[Dep. Biol. Sci., Plymouth Polytech., Drake Circus, Plymouth, Devon, England] Groups of carp and thick lipped mullet quickly learned to operate an

## FOODS/FEEDING (CONTINUED)

82-001672 CONTINUED underwater trigger for food reward. Single mullet also learned this operant response but single carp did not. Groups of mullet exhibited a higher rate of responding than groups of carp. Mullet appeared to feed in bouts, whereas carp fed randomly during the learning trials. Both species adapted well to six days continuous demand feeding. Grouped and single mullet decreased their feeding at night but carp did not show a diurnal feeding pattern. Feeding responses were found not to be sequences of random events and response rates over the six days were higher in carp than in mullet. In both species, individual fish within a group operated the trigger significantly more often than other fish but all fish took food and gained weight.

## AGE AND GROWTH

82-001673 Allen, J. R. M. and R. J. Wootton. THE EFFECT OF RATION AND TEMPERATURE ON THE GROWTH OF THE THREE-SPINED STICKLEBACK, *GASTEROSTEUS ACULEATUS* L. *J. Fish Biol.* 20(4):409-422. Apr. 1982. SFA 27(3)
[Dep. Zool., Univ. Coll. Wales, Aberystwyth, Dyfed SY23 3DA, Wales]

82-001674 Arawomo, G. A. O. THE AGE AND GROWTH OF JUVENILE BROWN TROUT IN LOCH LEVEN, KINROSS, SCOTLAND. *Arch. Hydrobiol.* 93(4):466-483. 1982. SFA 27(3)
[Dep. Zool., Univ. Ife, Ile-Ife, Nigeria] The age and growth of juvenile trout in Loch Leven were determined from the fish scale studies. Of the 363 specimens studied among the loch trout, 55.9% were found to be 1-migrants, 37.2% and 6.9% were found to be 2- and 3-migrants respectively. Growth in length and weight differed between 1-, 2- and 3-migrants. Fast growth in Loch Leven feeder streams was responsible for the high proportion of early migrants of juvenile trout into the loch. All migrant groups showed a faster growth during their first loch year. Compared with other lochs, growth of juvenile trout in Loch Leven was good and this was linked with the high productivity of the loch and the area of loch habitat relative to that of nursery stream habitat.

82-001675 Carlander, K. D. STANDARD INTERCEPTS FOR CALCULATING LENGTHS FROM SCALE MEASUREMENTS FOR SOME CENTRARCHID AND PERCID FISHES. *Trans. Am. Fish. Soc.* 111(3):332-336. May 1982. SFA 27(3)
[Dep. Anim. Ecol., Iowa State Univ., Ames 50011]

82-001676 Collins, B. W. GROWTH OF ADULT STRIPED BASS IN THE SACRAMENTO-SAN JOAQUIN ESTUARY. *Calif. Fish Game* 68(3):146-159. July 1982. SFA 27(3)
[Calif. Dep. Fish Game, Bay-Delta Fish. Proj., 4001 N. Wilson Way, Stockton 95205] Adult striped bass, *Morone saxatilis*, growth in the Sacramento-San Joaqin Estuary was described well by the von Bertalanffy growth equation. After age 3, females grew more rapidly than males and by age 6 they were as large as 7-yr-old males. The size bass attain as adults appeared to be affected by their growth rate as young-of-the-year. An average 2 cm decrease in adult mean length was associated with an 18% decrease in young bass growth rate commencing in 1970. Annual mean growth in 1971 was substantially higher than for any other year and was associated with abundant forage in San Francisco and San Pablo bays.

## AGE AND GROWTH (CONTINUED)

82-001677 Ferraris, C. J., Jr. and E. O. Murdy. ASPECTS OF SEXUAL DIMORPHISM AND FEEDING IN *PETROSCIRTES VARIABILIS* CANTOR (OSTEICHTHYS: BLENNIIDAE). *Micronesica* 17(1-2):157-159. Dec. 1981. SFA 27(3)
[Dep. Ichthyol., Am. Mus. Nat. Hist., Central Park West at 79th St., New York, NY 10024]

82-001678 Fisher, J. E. and E. J. Peters. AGE AND GROWTH OF CHANNEL CATFISH (*ICTALURUS PUNCTATUS*) IN BUCKLEY CREEK RESERVOIR, JEFFERSON COUNTY, NEBRASKA. *Proc. Nebr. Acad. Sci. Affil. Soc.* 92:10. 1982. Abstract only. SFA 27(3)
[Dep. For. Fish. Wildl., Inst. Agric. Nat. Resour., Univ. Nebr., Lincoln 68583-0819]

82-001679 Fraser, D. F. and R. D. Cerri. EXPERIMENTAL EVALUATION OF PREDATOR-PREY RELATIONSHIPS IN A PATCHY ENVIRONMENT: CONSEQUENCES FOR HABITAT USE PATTERNS IN MINNOWS. *Ecology* 63(2):307-313. Apr. 1982. SFA 27(3)
[Dep. Biol., Siena Coll., Loudonville, NY 12211] An experimental study, using the minnows *Semotilus atromaculatus* and *Rhinichthys atratulus*, was conducted in a seminatural artificial stream to evaluate the interaction of predator presence, habitat structural complexity, and time of day in determining habitat use patterns of prey. Predators were adult *S. atromaculatus*, while juveniles of both species were used as prey. Prey of both species actively avoid locations in the artificial stream that contain predators. However, structural complexity and time of day each have a mediating effect on the response of the prey fish to the presence of predators. While others have shown differential survivorship of prey, dependent upon structural complexity and time of day, this study shows how prey respond behaviorally to the presence of predators in habitat patches. They are most likely to enter those patches during daylight or when structure is present. In natural headwater streams prey fish are often found in patches of high predator density where prey density is often correlated with the degree of structural complexity. Our findings offer an explanation for this variability in relative abundances of predators and prey, by relating patch use by prey to habitat structural complexity and diel activity. Resulting implications for optimal foraging and guild organization are suggested.

82-001680 Hu, L. C. and P. R. Todd. AN IMPROVED TECHNIQUE FOR PREPARING EEL OTOLITHS FOR AGING. *N.Z. J. Mar. Freshwater Res.* 15(4):445-446. 1981. SFA 27(3)
[Fish. Res. Div., Mininst. Agric. Fish., Private Bag, Christchurch, New Zealand] The sagittal otoliths are removed from the eel and heated in a bunsen flame. Otolith fragments are embedded in clear silicone rubber sealant with the reading surface pressed against the surface of a microscope slide. The otoliths can then be read through the inverted slide under a binocular microscope using reflected light.

82-001681 Kain, D. G. A POST-IMPOUNDMENT STUDY OF AGE, GROWTH, AND CONDITION OF SELECTED ROUGH AND FORAGE FISHES IN CORDELL HULL RESERVOIR, TENNESSEE. *Tenn Tech J.* 16:64. 1981. Abstract only. SFA 27(3)
[Tenn. Tech Univ., Cookeville 38501]

82-001682 Lemly, A. D. and J. F. Dimmick. GROWTH OF YOUNG-OF-THE-YEAR AND YEARLING CENTRARCHIDS IN RELATION TO ZOOPLANKTON IN THE LITTORAL ZONE OF LAKES. *Copeia* 1982(2):305-321. 28 May 1982. SFA 27(3)
[Dep. Biol., Wake Forest Univ., Winston-Salem, NC 27109]

AGE AND GROWTH (CONTINUED)

82-001683 Mayberry, R. D. A COMPARATIVE AGE AND GROWTH STUDY OF WHITE BASS *MORONE CHRYSOPS* (RAFINESQUE) IN CENTER HILL RESERVOIR, TENNESSEE. *Tenn. Tech J.* 16:68. 1981. Abstract only. SFA 27(3)
[Tenn. Tech Univ., Cookeville 38501]

82-001684 Miller, S. J. and T. Storck. DAILY GROWTH RINGS IN OTOLITHS OF YOUNG-OF-THE-YEAR LARGEMOUTH BASS. *Trans. Am. Fish. Soc.* 111(4):527-530. July 1982. SFA 27(3)
[Ill. Nat. Hist. Surv. Lab., R.R. 1, Box 157, Sullivan 61951]

82-001685 Nelson, R. S. and C. S. Manooch III. GROWTH AND MORTALITY OF RED SNAPPERS IN THE WEST-CENTRAL ATLANTIC OCEAN AND NORTHERN GULF OF MEXICO. *Trans. Am. Fish. Soc.* 111(4):465-475. July 1982. SFA 27(3)
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82-001686 Oduleye, S. O. GROWTH AND GROWTH REGULATION IN THE CICHLIDS. *Aquaculture* 27(3):301-306. Apr. 1982. SFA 27(3)
[Dep. Biol. Sci., Univ. Ilorin, P.M.B. 1515, Ilorin, Nigeria] Environmental factors do not vary widely all the year round in the topics where cichlids are endemic. Conventional methods of growth monitoring and age determination such as scale and otolith annual rings are thus not directly applicable to them. The methods which have been used in monitoring growth in the cichlids are discussed along with the limitations of such methods. Sexual precocity is a serious limitation to large-scale pond-raising of cichlids. Moncsex culture and suppression of pituitary gonadotrophin production are two possible solutions to this problem.

82-001687 Papaconstantinou, C.; N. Tsimenidis and C. Daoulas. AGE, GROWTH AND REPRODUCTION OF RED MULLET (*MULLUS BARBATUS* L., 1758) IN THE GULFS OF SARONIKOS AND THERMAIKOS. *Thalassographica* 4(1):39-66. Aug. 1981. SFA 27(3)
[Inst. Oceanogr. Fish. Res., Athens, Greece] The age, growth and reproduction of red mullet (*Mullus barbatus*) in the Gulfs of Saronikos and Thermaikos during 1975-1978 were studied. The annual growth of males was estimated to be 11.7 mm in Saronikos and 10.0 mm in Thermaikos while the average annual increment for females was found to be 12.3 mm and 11.3 mm in Saronikos and Thermaikos Gulfs respectively. The red mullet appeared to present the smallest length growth as compared to that in all other Mediterranean areas. Males begin to mature right after the completion of the 1st annual ring while females after age two.

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[Tex. Parks Wildl. Dep., Austin 78744]

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[Pacific Gamefish Found., P.O. Box 25115, Honolulu, HI 96825]

82-001692 Robertson, A. I. POPULATION DYNAMICS AND FEEDING ECOLOGY OF JUVENILE AUSTRALIAN SALMON (*ARRIPIS TRUTTA*) IN WESTERN PORT, VICTORIA. *Aust. J. Mar. Freshwater Res.* 33(2):369-375. 1982. SFA 27(3)
[Div. Fish. Res., CSIRO, P.O. Box 20, North Beach, W.A. 6020, Australia] Juveniles (0 + age group) of both subspecies of the Australian salmon were captured over eelgrass meadows in Western Port at various times between October 1974 and February 1976. The western subspeces and the eastern subspecies were present from August through April, and December through May, respectively. The western subspecies always fed on benthic-dwelling prey including fishes, crabs and shrimps, and the eastern subspecies fed on prey which inhabited the water column (crustacean larvae, insects and epitokous polychaetes) in December but switched to benthic-dwelling prey (fishes, small squid, benthic crustaceans and polychaetes) in May. The role of different gill-raker number and morphology in effecting dietary separation of the subspecies is unclear.

82-001693 Schaefer, W. F.; W. A. Swenson and R. A. Heckmann. AGE, GROWTH AND TOTAL MORTALITY OF RAINBOW SMELT IN WESTERN LAKE SUPERIOR. *Trans. Wis. Acad. Sci. Arts Lett.* 69:15-20. 1981. SFA 27(3)
[Dep. Zool., Brigham Young Univ., Provo, UT] Age and growth were determined for 962 rainbow smelt, *Osmerus mordax* (Mitchill), captured from western Lake Superior in 1976 and 1977. The body-scale relationship, based on total length (mm, L) and scale radius (mm, S) was L = 74.3S + 1.2. Smelt attained average lengths of 64, 126, 162, 184 and 203 mm at ages 1 through 5 respectively. The length-weight relationship based on total length (mm, L) and weight (g, W) was $\log_{10}W = 3.01 \log_{10}L - 5.351$. Backcalculated mean length at age was greater for females than males at ages 3-5. Mortality rate was estimated from a sample of 3050 smelt captured from western Lake Superior between 1973 and 1977. The overall annual total mortality rate was estimated at 57%. Mortality was 40% during the fourth growing season and 69% during the fifth growing season. The mortality rate of males was higher than females as reflected in a sex ratio for mature smelt of 2.37 females per male. Warmer temperature and high food availability in the Superior-Duluth harbor resulted in faster growth of young-of-the-year smelt than in the lake proper.

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[N.Y. State Dep. Environ. Conserv., Watertown 13601]

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[Iowa Coop. Fish. Res. Unit, Iowa State Univ., Ames 50011]

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82-001696 Smith, D. C. AGE AND GROWTH OF JACKASS MORWONG (*NEMADACTYLUS MACROPTERUS* BLOCH & SCHNEIDER) IN EASTERN AUSTRALIAN WATERS. *Aust. J. Mar. Freshwater Res.* 33(2):245-253. 1982. SFA 27(3)
[N.S.W. State Fish., P.O. Box N211, Grosvenor St., N.S.W. 2000, Australia] *N. macropterus*, landed at the port of Eden, were sampled from July 1976 to June 1979. Saggital otoliths were used for age determination. A hyaline and an opaque ring were found to be formed during winter and summer, respectively. The growth of adult *N. macropterus* was adequately described by the von Bertalanffy growth curve. Females ($K=0.13$, $L_\infty=51.13$) were found to grow faster, and to a greater age, than males ($K=0.17$, $L_\infty=45.50$). No significant difference between sexes was apparent in the length-weight relationships.

82-001697 Snelson, F. F., Jr. INDETERMINATE GROWTH IN MALES OF THE SAILFIN MOLLY, *POECILIA LATIPINNA*. *Copeia* 1982(2):296-304. 28 May 1982. SFA 27(3)
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[Ariz. Game Fish Dep., 2222 W. Guenway Rd., Phoenix 85023]

82-001700 Wandsvik, A. and M. Jobling. OVSERVATIONS ON GROWTH RATES OF ARCTIC CHARR, *SALVELINUS ALPINUS* (L.), REARED AT LOW TEMPERATURE. *J. Fish Biol.* 20(6):689-699. June 1982. SFA 27(3)
[M. Jobling: Inst. Fiskerifag, Univ. Tromsø, 9001 Tromsø, Norway] Food intake and growth of Arctic charr, *Salvelinus alpinus*, in fresh water was studied at three temperatures (2.9, 8.4 and 13.1°C). Best growth and highest food intake occurred at 13.1°C. The approximate chemical composition was dependent upon rearing temperature, fish reared at the highest temperature depositing large quantities of fat. Fish were later grown on in either fresh or salt water where two growth patterns were observed. In the light of published data for *Salvelinus* spp., it is suggested that the poorest growth was shown by fish which were incapable of complete adaptation to saltwater conditions.

82-001701 Wilson, C. A.; J. M. Dean and R. Radtke. AGE, GROWTH RATE AND FEEDING HABITS OF THE OYSTER TOADFISH, *OPSANUS TAU* (LINNAEUS) IN SOUTH CAROLINA. *J. Exp. Mar. Biol. Ecol.* 62(3):251-259. 1 July 1982. SFA 27(3)
[Belle W. Baruch Inst. Mar. Biol., Univ. S. C., Columbia 29208] Age, gonad state, gut content, and length-weight relationships were analyzed for oyster toadfish, *Opsanus tau* (Linnaeus), caught in 1978-1980 at Hilton Head, South Carolina, Toadfish Tournaments. Examination of the otoliths revealed ages that ranged from <1 to 8 yr, with a median age of 3 yr. Fish were sexually mature between years 2 to 7. Combined length-weight data provided a linear regression line value of $W_L = 4.9e^{0.017L}$; the age-weight relationship was $W_t = 26.5e^{0.52t}$. An unexploited fishery is suggested by the data.

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[Dep. Biol., Westark Commun. Coll., Ft. Smith, AR 72901]

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[Biol. Dep., Univ. Exeter, Devon, England]

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[Inst. Ecol. Stud., Univ. N.D., Grand Forks 58202]

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[Tex. Parks Wildl. Br., P.O. Box 1707, Rockport 79382]

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82-001719 Mulian, R. and W. Yunfei. [NOTES ON FISHES FROM NAM CUO (LAKE) OF NORTHERN XIZANG (TIBET), CHINA.] *Acta Zool. Sin.* 28(1):85-98. 1982. In Chinese with English summ. SFA 27(3)
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82-001720 Peden, A. E. and G. W. Hughes. LIFE HISTORY NOTES RELEVANT TO THE CANADIAN STATUS OF THE SPECKLED DACE (*RHINICHTHYS OSCULUS*). *Syesis* 14:21-31. 1981. SFA 27(3)
[British Columbia Proc. Mus., Victoria, BC V8V 1X4, Canada] Speckled dace, *Rhinichthys osculus*, are reported to be rare in Canada, but many juveniles plus a few adults were collected from many localities in the Kettle and Granby Rivers of British Columbia. Fecundity and preponderance of juveniles suggest adequate reproduction, however, adults were scarcely represented and captured in only a few habitats. Provided there are no major

GEOGRAPHICAL DISTRIBUTION, FISH SURVEYS, ETC. (CONTINUED)

82-001720 CONTINUED alterations of the Kettle River environment by man, speckled dace are not endangered in Canada. We suggest adoption of an index to rank our threatened species so that comparison of levels of "endangeredness" can be made to pinpoint Canadian fish species needing greatest protection.

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82-001727 Shrestha, J. FISHES. *IN T. C. Majupuria, ed. Wild Is Beautiful, S. Devi, Lalitpur Colony, Lashkar (Gwalior), N.P. India* p. 94-136. 1981-1982. SFA 27(3)
Available @ $50.00 from T. C. Majupuria, Dep. Zool., Tribhuvan Univ., Kirtipur, Kathmandu, Nepal]

82-001728 Shute, J. R.; P. W. Shute and D. G. Lindquist. FISHES OF THE WACCAMAW RIVER DRAINAGE. *Brimleyana* 6:1-24. Dec. 1981. SFA 27(3)
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## ABUNDANCE, FACTORS OF; SURVIVAL AND MORTALITY

82-001741 Conover, D. O. SEASONAL MIGRATION, REPRODUCTIVE STRATEGY, AND ENVIRONMENTAL SEX DETERMINATION AND ITS ADAPTIVE SIGNIFICANCE IN THE ATLANTIC SILVERSIDE, *MENIDIA MENIDIA*. *Ph.D. dissertation, Univ. Mass.* 118p. 1982. From Diss. Abstr. Int. B Sci. Eng. 42(12):4705. June 1982. SFA 27(3)
Analyses of catch records of the inshore and offshore bottom trawl survey program of the National Marine Fisheries Service revealed that populations of *M. menidia* north of Cape Hatteras undergo an offshore migration in winter. Most collections were confined to the inner continental shelf within 50 km of the shoreline and occurred in waters less than 50 m deep. The winter movement and mortality patterns of *M. menidia* suggest a substantial net-export of biomass from salt marsh to offshore communities. Daily observations during high tide at a salt marsh in Salem Harbor, Massachusetts demonstrated that spawning was highly periodic, coincided with the occurrence of new and full moons, and was also highly correlated with tidal height. Spawing in the laboratory occurred every 1-3 days, rather than fortnightly, whether natural celestial cues were available (outdoor pools) or not (indoor aquaria). Mating was promiscuous and occurred in small groups of from 5-10 to several hundred fish. The reproductive ecology of *M. menidia* in Massachusetts differs from that in South Carolina in terms of timing, egg substrates, and mating behavior. Sex determination in *M. menidia* is under the control of both temperature and genotype during a specific period of larval development. Sex ratios of progeny from different females are highly variable and differ in degree of response to temperature. This demonstrates that sex ratio in fishes that normally have separate sexes can be influenced by the environment. The adaptive significance of temperature-dependent sex determination in *Menidia* appears to be related to the survivorship schedule, size-selective mortality, mating strategy, and differences in how the sexes invest resources in the production of gametes. Large individuals survive the winter in higher proportions than small individuals, regardless of sex, but large size is more important to increasing the fertility of females than males because ovarian weights are an increasing function of size while testicular weights are not. These findings are in agreement with the current theory concerning sex allocation and the evolution of environmental sex determination.

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[Fac. Agric., Tohoku Univ., Sendai 980, Japan] Three heterosomes, stone flounder, plaice and dab are distributed over an almost common area on the continental shelf in Sendai Bay and feed on the common food, infauna organisms. Although the stock levels of the former two species have declined under the recent heavy fishing, conversely that of the latter has increased to a high level. These phenomena seem to result from the fact that while both stone flounder and plaice spawn in late autumn-winter, being long-lived, large-sized and low in intrinsic rate of natural increase $r_m$, and reveal a stable pattern of population change, dab spawns in late winter-spring, being short-lived, small-sized and high in $r_m$, and shows a variable pattern of fluctuation in recruitment.

## ABUNDANCE, FACTORS OF; SURVIVAL AND MORTALITY (CONTINUED)

82-001743 Marshall, B. E. THE INFLUENCE OF RIVER FLOW ON PELAGIC SARDINE CATCHES IN LAKE KARIBA. *J. Fish Biol.* 20(4):465-469. Apr. 1982. SFA 27(3)

[Lake Kariba Fish. Res. Inst., P.O. Box 75, Kariba, Zimbabwe] The nutrient level of Lake Kariba is governed by the Zambezi river which provides about 70% of its water supply. Other tributaries are richer in nutrients and have an appreciable local effect. This is shown by the catches of *Limnothrissa miodon* which increase after strong flows in the Sanyati river. This is in contrast to natural lakes such as Lake Tanganyika and may be an important management factor in Lake Kariba and other man-made lakes. Possible periods of poor rainfall could thus reduce the *Limnothrissa* yield in Lake Kariba.

82-001744 Mills, C. A. FACTORS AFFECTING THE SURVIVAL OF DACE, *LEUCISCUS LEUCISCUS* (L.), IN THE EARLY POST-HATCHING PERIOD. *J. Fish Biol.* 20(6):645-655. June 1982. SFA 27(3)

[Freshwater Biol. Assoc., River Lab., East Stoke, Wareham, Dorset BH20 6BB, England] Young dace fry were stocked into nylon mesh cages at densities ranging from 0.044 to 7.230 $1^{-1}$, and the cages anchored in a backwater area where the fry gathered naturally. The fry began feeding on small organisms drifting into the cages 2-4 days after hatching. The growth rate of the fry was inversely proportional, and the death rate directly proportional, to initial density. Soon after the exhaustion of endogenous food reserves (as determined from unfed.fry), there was a period of massive mortality at the highest initial densities, probably due to starvation. After 20 weeks, the cages stocked at the two highest initial densities contained the lowest biomass of fry. Transfer of fry to cages with a larger mesh size produced increased growth and 46% survival over 20 weeks at the lowest initial density. These fry reached an overwintering length of 35.5 mm compared with 48.0 mm for naturally occurring fry.

82-001745 Paloheimo, J. E.; L. L. McDonald and S. A. Butler. ESTIMATION OF FISH MORTALITY. *Trans. Am. Fish. Soc.* 111(4):535-537. July 1982. SFA 27(3)

[Dep. Zool., Univ. Toronto, Toronto, ON M5S 1A1, Canada]

82-001746 Serns, S. L. INFLUENCE OF VARIOUS FACTORS ON DENSITY AND GROWTH OF AGE-0 WALLEYES IN ESCANABA LAKE, WISCONSIN, 1958-1980. *Trans. Am. Fish. Soc.* 111(3):299-306. May 1982. SFA 27(3)

[Wis. Dep. Nat. Resour., Box 440, Woodruff 54568]

82-001747 Toth, L. A.; D. R. Dudley; J. R. Karr and O. T. Gorman. NATURAL AND MAN-INDUCED VARIABILITY IN A SILVERJAW MINNOW (*ERICYMBA BUCCATA*) POPULATION. *Am. Midl. Nat.* 107(2):284-293. Apr. 1982. SFA 27(3)

[Dep. Ecol. Ethol. Evol., 606 E. Healey, Univ. Ill., Champaign 61820] During 8 years of fish sampling in an agricultural watershed, density of the silverjaw minnow *Ericymba buccata* fluctuated widely with a population outbreak in 1976 followed by a rapid decline. Accompanying these fluctuations were changes in population structure that were linked to differential mortality and variation in recruitment. Factors responsible for the demise of this species in the watershed included: severe droughts during 1976 and 1978; consecutive harsh winters in 1976-1977, 1977-1978 and 1978-1979; fish kills; and modified habitat conditions brought about by stream alterations.

82-001748 Wandsvik, A. and M. Jobling. OVERWINTERING MORTALITY OF MIGRATORY ARCTIC CHARR, *SALVELINUS ALPINUS*, (L.) REARED IN SALT WATER. *J. Fish Biol.* 20(6):701-706. June 1982. SFA 27(3)

## ABUNDANCE, FACTORS OF; SURVIVAL AND MORTALITY (CONTINUED)

82-001748 CONTINUED
[M. Jobling: Inst. Fiskerifag, Univ. Tromsø, 9001 Tromsø, Norway] The mortality of Arctic charr, *Salvelinus alpinus*, previously grown-on in salt water during the summer months, was studied during the winter 1980-81. Mortality did not appear to be related to a 'critical size' but rather to rates of growth shown by the fish during the summer months. Mortality was high amongst the slow-growing fish. The results are discussed in relation to published data on the osmoregulatory capabilities of *Salvelinus* spp.

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82-001749 Beamish, R. J. *LAMPETRA MACROSTOMA*, A NEW SPECIES OF FRESHWATER PARASITIC LAMPREY FROM THE WEST COAST OF CANADA. *Can. J. Fish. Aquatic Sci.* 39(5):736-747. May 1982. In English with French summ. SFA 27(3)
[Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada]

82-001750 Branstetter, S. PROBLEMS ASSOCIATED WITH THE IDENTIFICATION AND SEPARATION OF THE SPINNER SHARK, *CARCHARHINUS BREVIPINNA*, AND THE BLACKTIP SHARK, *CARCHARHINUS LIMBATUS*. *Copeia* 1982(2):461-465. 28 May 1982. SFA 27(3)
[Dep. Wildl. Fish. Sci., Tex. A&M Univ., College Station 77843]

82-001751 Bussing, W. A. *ELACATINUS JANSSI*, A NEW GOBIID FISH FROM COSTA RICA. *Rev. Biol. Trop.* 29(2):251-256. Dec. 1981. In English with Spanish summ. SFA 27(3)
[Esc. Biol., Univ. Costa Rica, Costa Rica]

82-001752 Collette, B. B. TWO NEW SPECIES OF FRESHWATER HALFBEAKS (PISCES: HEMIRAMPHIDAE) OF THE GENUS *ZENARCHOPTERUS* FROM NEW GUINEA. *Copeia* 1982(2):265-276. 28 May 1982. SFA 27(3)
[Syst. Lab., NMFS, Natl. Mus. Nat. Hist., Washington, DC 20560]

82-001753 Dawson, C. E. and P. Fourmanoir. *MICROPHIS CRUENTUS*, A NEW DORYRHAMPHINE PIPEFISH (SYNGNATHIDAE) FROM NEW CALEDONIA. *Micronesica* 17(1-2):113-118. Dec. 1981. SFA 27(3)
[Gulf Coast Res. Lab. Mus., Ocean Springs, MS 39564]

82-001754 Dawson, C. E. REVIEW OF THE INDO-PACIFIC PIPEFISH GENUS *DORYRHAMPHUS* KAUP (PISCES: SYNGNATHIDAE), WITH DESCRIPTIONS OF A NEW SPECIES AND A NEW SUBSPECIES. *Ichthyol. Bull. J. L. B. Smith Inst. Ichthyol.* No. 44. 27p. Nov. 1981. SFA 27(3)
[Gulf Coast Res. Lab. Mus., Ocean Springs, MS 39564]

82-001755 Fernholm, B. *EPTATRETUS CARIBBEAUS*: A NEW SPECIES OF HAGFISH (MYXINIDAE) FROM THE CARIBBEAN. *Bull. Mar. Sci.* 32(2):434-438. Apr. 1982. SFA 27(3)
[Dep. Biol. Chem., Roskilde Univ., Box 260, DK-4000 Roskilde, Denmark]

## IDENTIFICATION, KEYS, CLASSIFICATION (CONTINUED)

82-001756 Franssen, J. and G. Nibaruta. UTILISATION DE LA TECHNIQUE D'ÉLECTROPHORÈSE DANS LA SYSTÉMATIQUE DES POISSONS. [UTILIZATION OF ELECTROPHORETIC TECHNIQUES FOR THE SYSTEMATICS OF FISH.] *Hydrobiologia* 88(3):289-293. 9 Apr. 1982. In French with English summ. SFA 27(3)
[Lab. Ethol. Aquarium, Inst. Zool., Univ. Liège, Belgium] Using agar gel electrophoresis, the number and relative mobility of seric protein fractions has been determined for twelve species of fishes belonging to the Elasmobranchii, Dipnoi and Actinopterygii. The study of relative mobilities has shown both similitudes and divergences between some of the proteinograms. Immunoelectrophoretic cross tests using the twelve sera and five antisera have shown that these similitudes did not result from protein homology and thus agar gel electrophoresis could not be used to determine phylogenetic relationships between the species considered.

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[Dep. Zool., Victoria Univ. Wellington, Private Bag, Wellington, New Zealand]

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[JLB Smith Inst. Ichthyol., Rhodes Univ., Grahamstown, South Africa]

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[Inst. Zool. Univ., Saarstr. 21, D-6500 Mainz, West Germany]

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[Swed. Mus. Nat. Hist., Sect. Vet. Zool., S-104 05 Stockholm, Sweden]

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[Steinhart Aquarium, Calif. Acad. Sci., Golden Gate Park, San Francisco 94118]

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[Scripps Inst. Oceanogr., Univ. Calif., La Jolla]

82-001763 Nelson, J. S. TWO NEW SOUTH PACIFIC FISHES OF THE GENUS *EBINANIA* AND CONTRIBUTIONS TO THE SYSTEMATICS OF PSYCHROLUTIDAE (SCORPAENIFORMES). *Can. J. Zool.* 60(6):1470-1504. June 1982. SFA 27(3)
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[Inst. Oceanol., USSR Acad. Sci., Moscow]

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[Bernice P. Bishop Mus., P.O. Box 19000-A, Honolulu, HI 96819]

82-001766 Randall, J. E. and J. E. McCosker. TWO NEW SERRANID FISHES OF THE GENUS *ANTHIAS* FROM THE CENTRAL PACIFIC. *J. Aquaricult.* 2(3):59-69. Sept. 1982. SFA 27(3)
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[Calif. Acad. Sci., Golden Gate Park, San Francisco 94118]

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[Univ. Colo. Mus., Boulder 80309]

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[Dep. Vert. Zool., Natl. Mus. Nat. Hist., Smithsonian Inst., Washington, DC 20560]

82-001773 Vladykov, V. D. and E. Kott. CORRECT SCIENTIFIC NAMES FOR THE LEAST BROOK LAMPREY AND THE AMERICAN BROOK LAMPREY (*PETROMYZONTIDAE*). *Can. J. Zool.* 60(5):856-864. May 1982. In English with French summ. SFA

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82-001774 Wang, J. C. S. TAXONOMY OF THE EARLY LIFE STAGES OF FISHES. *Prepared for Pac. Gas. Elec. Co., 77 Beale St., San Francisco, CA 94106* xxxvii + 168 p. Oct. 1981. SFA 27(3)
[Ecological Analysts, Inc., 2150 John Glenn Drive, Concord, CA 94520]

82-001775 Waples, R. S. THE BIOCHEMICAL AND MORPHOLOGICAL REVIEW OF THE LIZARDFISH GENUS *SAURIDA* IN HAWAII, WITH THE DESCRIPTION OF A NEW SPECIES. *Pac. Sci.* 35(3):217-235. July 1981. SFA 27(3)
[Scripps Inst. Oceanogr., Univ. Calif., La Jolla, CA 92093]

82-001776 Winterbottom, R. A REVISION OF THE CONGROGADID FISH GENUS *HALIDESMUS* (PISCES: PERCIFORMES), WITH THE DESCRIPTION OF A NEW SPECIES FROM KENYA AND A LIST OF THE SPECIES INCLUDED IN THE FAMILY. *Can. J. Zool.* 60(5):754-763. May 1982. In English with French summ. SFA 27(3)
[Dep. Ichthyol. Herpetol., R. Ontario Mus., 100 Queen's Park, Toronto, ON M5S 2C6, Canada]

## PARASITES AND DISEASES-GENERAL

82-001777 Arthur, J. R.; L. Margolis; D. J. Whitaker and T. E. McDonald. A QUANTITATIVE STUDY OF ECONOMICALLY IMPORTANT PARASITES OF WALLEYE POLLOCK (*THERAGRA CHALCOGRAMMA*) FROM BRITISH COLUMBIAN WATERS AND EFFECTS OF POSTMORTEM HANDLING ON THEIR ABUNDANCE IN THE MUSCULATURE. *Can. J. Fish. Aquatic Sci.* 39(5):710-726. May 1982. In English with French summ. SFA 27(3)
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[Med. Vet., S.I.R.A.P., S.p.A., Via Murazzi, 30010 Pellestrina, Venice, Italy]

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[Salmon Res. Inst., S-810 70 Älvkarleby, Sweden]

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[Dep. Biol., Indiana State Univ., Evansville 47712]

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[Aquasci. Res. Group, 1100 Gentry, North Kansas City, MO 64116]

82-001783 Mitchell, A. J. VARIATIONS IN EFFECTIVENESS OF CHEMICAL TREATMENTS FOR DISEASE CONTROL. *Proc. Fish Farm. Conf. Annu. Conv. Fish Farm. Tex.* 1981:30-35. 1981. SFA 27(3)
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[Dep. Nat. Sci., North Kedzie Lab., Mich. State Univ., East Lansing 48824]

82-001786 Muzzall, P. M. METAZOAN PARASITES OF FISH FROM THE RED CEDAR RIVER, INGHAM COUNTY, MICHIGAN. *Proc. Helminthol. Soc. Wash.* 49(1):93-98. Jan. 1982. SFA 27(3)
[Dep. Nat. Sci., North Kedzie Lab., Mich. State Univ., East Lansing 48824]

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[Dep. Biol., Memorial Univ., St. John's, NF A1B 3X9, Canada]

## BACTERIAL DISEASES

82-001789 Andrews, C. LATENT INFECTIONS WITH AEROMONAS SALMONICIDA. *Bull. Eur. Assoc. Fish Pathol.* 1(2):25. Dec. 1981. SFA 27(3)
[Yorkshire Water Auth., Olympia House, Gelderd Rd., Leeds LS12 6DD, Yorkshire, England]

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82-001790 Bruno, D. W. and A. L. S. Munro. DETECTION OF THE CAUSATIVE AGENT OF BACTERIAL KIDNEY DISEASE. *Bull. Eur. Assoc. Fish Pathol.* 2(1):10-12. Apr. 1982. SFA 27(3)
[DAFS Mar. Lab., Victoria Rd., Aberdeen, Scotland]

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[Natl. Fish. Res. Cent., Bldg. 204 Naval Support Activity, Seattle, WA 98115]

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[Dep. Biol., Univ. Stirling, Stirling FK9 4LA, Scotland]

82-001793 Johnson, K. A.; J. K. Flynn and D. F. Amend. ONSET OF IMMUNITY IN SALMONID FRY VACCINATED BY DIRECT IMMERSION IN *VIBRIO ANGUILLARUM* AND *YERSINIA RUCKERI* BACTERINS. *J. Fish Dis.* 5(3):197-205. May 1982. SFA 27(3)
[D. F. Amend: Dep. Med., Sch. Vet. Med., Univ. Calif., Davis 95616] The fry of several salmonid species was vaccinated by direct immersion in either *Yersinia ruckeri* or *Vibrio anguillarum* bacterin and the level of protective immunity was determined by the survival of fish after bath challenge with virulent organisms. The immersion time for effective vaccination was obtained within 5s and protective immunity was demonstrated within 5 days at 18°C and within 10 days at 10°C. The minimum size at which maximum protective immunity occurred was between 1.0 and 2.5g. Immunity appeared to be a function of size and not age, but differences in response among several species was indicated. In fish under 1.0g, the level of protective immunity could be increased using a more concentrated bacterin. The results were similar with both bacterins.

82-001794 Johnson, K. A.; J. K. Flynn and D. F. Amend. DURATION OF IMMUNITY IN SALMONIDS VACCINATED BY DIRECT IMMERSION WITH *YERSINIA RUCKERI* AND *VIBRIO ANGUILLARUM* BACTERINS. *J. Fish Dis.* 5(3):207-213. May 1982. SFA 27(3)
[D. F. Amend: Dep. Med., Sch. Vet. Med., Univ. Calif., Davis 95616] The level of protective immunity was determined for several salmonid species following vaccination by the direct immersion method with commercial *Vibrio anguillarum* (two serotypes) and *Yersinia ruckeri* (Hagerman strain) bacterins. The duration of protective immunity varied with the bacterin concentration, size and species of fish, but the duration between the two bacterins was comparable. In fish under 1g duration of protective immunity was longest when the most concentrated bacterin was used. Generally, immunity lasted in 1-g fish for about 120 days, in 2-g fish for about 180 days, but in 4-g fish and larger immunity lasted for a year of longer. Coho salmon (*Oncorhynchus kisutch*) and sockeye salmon (*O. nerka*) retained immunity for a longer time and pink salmon (*O. gorbuscha*) the shortest time. Chinook salmon (*O. tshawytscha*) and rainbow trout (*Salmo gairdneri*) were intermediate. Field data generally followed the laboratory tests, but the duration appeared somewhat shortened. In one test 20-g rainbow trout were vaccinated by the shower method and no loss of immunity occurred after 311 days.

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[Inst. Hygiene Microbiol., Royal Vet. Agric. Univ., Bülowsvej 13, DK-1870 Copenhagen V, Denmark]

82-001796 McCarthy, D. H. and K. A. Johnson. A SEROTYPIC SURVEY AND CROSS-PROTECTION TEST OF NORTH AMERICAN FIELD ISOLATES OF *YERSINIA RUCKERI*. *J. Fish Dis.* 5(4):323-328. July 1982. SFA 27(3)
[Pitman-Moore, Inc., P.O. Box 344, Titusville, Washington Crossing, NJ 08560]

82-001797 Mellergaard, S. and J. L. Larsen. HAEMAGGLUTINATING ACTIVITY OF *AEROMONAS SALMONICIDA* AND *VIBRIO ANGUILLARUN* STRAINS ISOLATED FROM DISEASED RAINBOW TROUT (*SALMO GAIRDNERI*). *Bull. Eur. Assoc. Fish Pathol.* 1(2):26-28. Dec. 1981. SFA 27(3)
Gülowsvej 13, DK-1870 Copenhagen V, Denmark]

82-001798 Munn, C. B. and T. J. Trust. BACTERIAL DISEASES OF FISH--THE MOLECULAR BASIS OF INFECTION AND IMMUNITY. *Bull. Eur. Assoc. Fish Pathol.* 1(2):21-25. Dec. 1981. SFA 27(3)
[Dep. Biol. Sci., Plymouth Polytech., Plymouth PL4 8AA, England]

82-001799 Nakai, T.; K. Muroga and H. Wakabayashi. AN IMMUNOELECTROPHORETIC ANALYSIS OF *PSEUDOMONAS ANGUILLISEPTICA* ANTIGENS. *Bull. Jpn. Soc. Sci. Fish.* 48(3):363-367. Mar. 1982. SFA 27(3)
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[Hokkaido Salmon Hatchery, Nakanoshima, Toyohiraku, Sapporo, Hokkaido, Japan]

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## BACTERIAL DISEASES (CONTINUED)

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[West. Aust. Mar. Res. Lab., P.O. Box 20, North Beach, West Aust., 6020, Australia] The results of three sets of experiments to determine the effects on fish of effluent from a titanium dioxide plant are presented. The acute incipient lethal concentration of the batch of effluent tested (free sulphuric acid 26.3g/1, soluble ferrous iron 6.55g/1) was ca 3,200 p.p.m. (21 p.p.m. iron, pH 5.1) for juvenile yellow-eye mullet (*Aldrichetta*

POLLUTION (CONTINUED)

82-001867 CONTINUED *forsteri*) and ca 2,930 p.p.m. (19 p.p.m. iron, pH 5.4) for juvenile school whiting (*Sillago bassensis*). Oxidising ferrous iron had an acute incipient lethal concentration of ca 6 p.p.m. to juvenile yellow-eye mullet on first exposure. Iron lost its toxic properties as soluble ferrous iron oxidised to insoluble, flocculent ferric iron. Juvenile yellow-eye mullet tolerated very brief (ca 60s) exposure to pH 2 but were rendered motionless for the period of exposure. For juvenile school whiting the values were pH 2.4 for ca 30s. Fish from a variety of species tended to avoid the cloud produced by the addition of ferrous iron to seawater when the iron concentration in the cloud was 0.5 p.p.m. Experiments with clouds produced by the addition of silica to seawater indicated that the avoidance behaviour was a visual phenomenon. Caution is advised in the extrapolation of the results of laboratory experimentation to the field situation.

82-001868 Giattina, J. D.; R. R. Garton and D. G. Stevens. AVOIDANCE OF COPPER AND NICKEL BY RAINBOW TROUT AS MONITORED BY A COMPUTER-BASED DATA ACQUISITION SYSTEM. *Trans. Am. Fish. Soc.* 111(4):491-504. July 1982. SFA 27(3)
[Corvallis Environ. Res. Lab., U.S. EPA, 200 Southwest 35th Street, Corvallis, OR 97333]

82-001869 Griesbach, S.; R. H. Peters and S. Youakim. AN ALLOMETRIC MODEL FOR PESTICIDE BIOACCUMULATION. *Can. J. Fish. Aquatic Sci.* 39(5):727-735. May 1982. In English with French summ. SFA 27(3)
[Dep. Biol., McGill Univ., 1205 Ave. Docteur Penfield, Montreal, PQ H3A 1B1, Canada]

82-001870 Heit, M. and C. S. Klusek. THE EFFECTS OF DISSECTING TOOLS ON THE TRACE ELEMENT CONCENTRATIONS OF FISH AND MUSSEL TISSUES. *Sci. Total Environ.* 24(3):129-134. June 1982. SFA 27(3)
[Environ. Measure. Lab., U.S. Dep. Energy, New York, NY 10014]

82-001871 Herrick, C. J.; E. D. Goodman; C. A. Guthrie; R. H. Blythe; G. A. Hendrix; R. L. Smith and J. E. Galloway. A MODEL OF MERCURY CONTAMINATION IN A WOODLAND STREAM. *Ecol. Model.* 15(1):1-28. Feb. 1982. SFA 27(3)
[Storage Technol. Corp., Louisville, CO] A model for the accumulation of mercury in four compartments of a woodland stream has been set up. The four components considered are sediments, detritus, invertebrates and fish. The model inputs are concentrations of dissolved monomethyl mercury and dissolved inorganic mercury ($Hg^{2+}$) in the water. The model predicts that some reevaluation of current safe mercury concentrations in water may be needed in order to keep mercury concentrations in fish below current action levels.

82-001872 International Council for the Exploration of the Sea. REPORT OF THE ADVISORY COMMITTEE ON MARINE POLLUTION, 1981. *Int. Counc. Explor. Sea Coop. Res. Rep.* No. 112. 67p. Jan. 1982. SFA 27(3)
[Palaegade 2-4, 1261 Copenhagen K, Denmark]

82-001873 Jensen, A. L.; S. A. Spigarelli and M. M. Thommes. PCB UPTAKE BY FIVE SPECIES OF FISH IN LAKE MICHIGAN, GREEN BAY OF LAKE MICHIGAN, AND CAYUGA LAKE, NEW YORK. *Can. J. Fish. Aquatic Sci.* 39(5):700-709. May 1982. In English with French summ. SFA 27(3)
[Sch. Nat. Resour., Univ. Mich., Ann Arbor 48109]

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82-001874 Kaiser, K. L. E. EARLY TREND DETERMINATION OF ORGANOCHLORINE CONTAMINATION FROM RESIDUE RATIOS IN THE SEA LAMPREY (*PETROMYZON MARINUS*) AND ITS LAKE WHITEFISH (*COREGONUS CLUPEAFORMIS*) HOST. *Can. J. Fish. Aquatic Sci.* 39(4):571-579. Apr. 1982. In English with French summ. SFA 27(3)
[Can. Cent. Inland Water, Burlington, ON L7R 4A6, Canada]

82-001875 Kearns, P. K. and R. J. Vetter. MANGANESE-54 ACCUMULATION BY *CHLORELLA* SPP., *DAPHNIA MAGNA* AND YELLOW PERCH (*PERCA FLAVESCENS*). *Hydrobiologia* 88(3):277-280. 9 Apr. 1982. SFA 27(3)
[Oper. Environ. Safety Div., U.S. Dep. Energy, 9800 Cass Ave., Argonne, IL 60439]

82-001876 Lederman, T. C. and G-Y. Rhee. BIOCONCENTRATION OF A HEXACHLOROBIPHENYL IN GREAT LAKES PLANKTONIC ALGAE. *Can. J. Fish. Aquatic Sci.* 39(3):380-387. Mar. 1982. In English with French summ. SFA 27(3)
[G-Yull Rhee: Environ. Health Inst., Div. Lab. Res., N.Y. State Dep. Health, Albany 12201]

82-001877 Lederman, T. C. and G-Y. Rhee. INFLUENCE OF A HEXACHLOROBIPHENYL IN GREAT LAKES PHYTOPLANKTON IN CONTINUOUS CULTURE. *Can. J. Fish. Aquatic Sci.* 39(3):388-394. Mar. 1982. In English with French summ. SFA 27(3)
[G-Yull Rhee: Environ. Health Inst., Div. Lab. Res., N.Y. State Dep. Health, Albany 12201]

82-001878 Martin, H. C., (Prog. Chairman). LONG RANGE TRANSPORT OF AIRBORNE POLLUTANTS AND ACID RAIN CONFERENCE. *Water Air Soil Pollut.* 18(1-3):1-430. July, Aug., Sept. 1982. SFA 27(3)
A collection of papers.--RS.

82-001879 Norton, M. G.; R. A. Eagle; R. S. Nunny; M. S. Rolfe; P. A. Hardiman and B. L. Hampson. THE FIELD ASSESSMENT OF EFFECTS OF DUMPING WASTES AT SEA: 8. SEWAGE SLUDGE DUMPING IN THE OUTER THAMES ESTUARY. *Fish Res. Tech. Rep. Minist. Agric. Fish. Food (Lowestoft)* No. 62. 62p. 1981. SFA 27(3)
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[Dep. Civil Eng., Univ. Ill., Urbana] Using the Ames *Salmonella*/mammalian microsome assay the mutagenic activity of fish and benthic sediments from a section of the Sheep River, Alberta receiving a chlorinated sewage effluent were investigated. The benthic sediments gave no indication of increased mutagenic activity, however fish collected from the chlorinated sewage plume showed a significant increase in mutagenic activity. The results are discussed with respect to the effects of a chlorinated sewage effluent on the lotic ecosystem in this section of the river.

82-001881 Passino, D. R. M. and J. M. Kramer. SUBCELLULAR DISTRIBUTION OF MERCURY IN LIVER OF LAKE TROUT (*SALVELINUS NAMAYCUSH*). *Experientia (Basel)* 38(6):689-690. 15 June 1982. SFA 27(3)
[U.S. FWS, Great Lakes Fish Lab., Ann Arbor, MI 48105]

POLLUTION (CONTINUED)

82-001881 CONTINUED

82-001882 Penrose, D. L. and D. R. Lenat. EFFECTS OF APPLE ORCHARD RUNOFF ON THE AQUATIC MACROFAUNA OF A MOUNTAIN STREAM. *Arch. Environ. Contam. Toxicol.* 11(3):383-388. 1982. SFA 27(3)
[N.C. Div. Environ. Manage., P.O. Box 27687, Raleigh 27611]

82-001883 Poston, T. M. OBSERVATIONS ON THE BIOACCUMULATION POTENTIAL OF THORIUM AND URANIUM IN RAINBOW TROUT (*SALMO GAIRDNERI*). *Bull. Environ. Contam. Toxicol.* 28(6):682-690. June 1982. SFA 27(3)
[Ecol. Sci. Dep., Pac. Northwest Lab., Richland, WA 99352]

82-001884 Stirn, J. MANUAL OF METHODS IN AQUATIC ENVIRONMENT RESEARCH. PART 8. ECOLOGICAL ASSESSMENT OF POLLUTION EFFECTS. *FAO Fish. Tech. Pap.* No. 209. viii + 70p. 1981. SFA 27(3)
[Reg. Activ. Cent. MEDV, Cent. Rech. Oceanogr. Pêches, Algiers, Algeria]

82-001885 Zabik, M. E.; C. Merrill and M. J. Zabik. PREDICTABILITY OF PCBs IN CARP HARVESTED IN SAGINAW BAY, LAKE HURON. *Bull. Environ. Contam. Toxicol.* 28(5):592-598. May 1982. SFA 27(3)
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82-001887 Halter, F. and J. T. Thomas. RECOVERY OF DAMAGES BY STATES FOR FISH AND WILDLIFE LOSSES CAUSED BY POLLUTION. *Ecol. Law Q.* 10(1):5-35. 1982. SFA 27(3)
[Univ. Pa. Sch. Law, Philadelphia]

TOXICOLOGY; BIOASSAYS

82-001888 Addison, R. F.; M. E. Zinck; D. E. Willis and J. J. Wrench. INDUCTION OF HEPATIC MIXED FUNCTION OXIDASE ACTIVITY IN TROUT (*SALVELINUS FONTINALIS*) BY AROCLOR 1254 AND SOME AROMATIC HYDROCARBON PCB REPLACEMENTS. *Toxicol. Appl. Pharmacol.* 63(2):166-172. Apr. 1982. SFA 27(3)
[Mar. Ecol. Lab., Bedford Inst. Oceanogr., Dartmouth, NS B2Y 4A2, Canada]

82-001889 Amelung, M. AUSWIRKUNGEN GELÖSTER EISENVERBINDUNGEN AUF DIE EI- UND LARVALENTWICKLUNG VON *SALMO GAIRDNERI* (RICHARDSON). [EFFECTS OF DISSOLVED IRON COMPOUNDS ON DEVELOPING EGGS AND LARVAE OF

## TOXICOLOGY; BIOASSAYS (CONTINUED)

82-001889 CONTINUED *SALMO GAIRDNERI* (RICHARDSON).] *Arch. Fischereiwiss.* 32(1-3):77-87. Apr. 1982. In German with English summ. SFA 27(3)
[Univ. Hamburg, Olbersweg 24, 2000 Hamburg 50, West Germany] An apparatus for continuously saturated water with dissolved iron salts is presented and effects of iron on developing eggs and larvae of the rainbow trout (*Salmo gairdneri*, Richardson) are studied. It could be shown that the embryogenesis is delayed at iron concentrations of 5.7 mg/l. No increased mortality however was found below 5.7 mg/l. Even at higher concentrations (11.8 mg/l) no increased mortality was observed when eggs have been activated with iron containing water. Larvae however died to 100% 3 days after hatching in concentrations of 1.3 mg/l. Morphometrical investigations could show a sublethal damage of newly-hatched larvae. They were significantly shorter when incubated at 5.7 mg/l.

82-001890 Amend, D. F.; B. A. Goven and D. G. Elliot. ETOMIDATE: EFFECTIVE DOSAGES FOR A NEW FISH ANESTHETIC. *Trans. Am. Fish. Soc.* 111(3):337-341. May 1982. SFA 27(3)
[Sch. Vet. Med., Dep. Med., Univ. Calif., Davis 95616]

82-001891 Andreasen, J. K. and N. E. Hall. TOXAPHENE RESISTANCE IN MOSQUITOFISH FROM THE RIO GRANDE VALLEY OF TEXAS. *Annu. Proc. Tex. Chap. Am. Fish. Soc.* 4:110. 1981[1982]. Abstract only. SFA 27(3)
[U.S. FWS, P.O. Box 2087, Victoria, TX 77902] Mosquitofish collected from an agricultural area of the Rio Grande Valley showed a 30-fold increased tolerance to toxaphene over mosquitofish not normally exposed to agricultural pesticides from the Aransas National Wildlife Refuge. The results show that the resistant fish, by bioaccumulation of toxaphene, may pose a hazard to predatory species of fish and wildlife.

82-001892 Baker, J. P. and C. L. Schofield. ALUMINUM TOXICITY TO FISH IN ACIDIC WATERS. *Water Air Soil Pollut.* 18(1-3):289-309. July, Aug., Sept. 1982. SFA 27(3)
[Sch. For. Environ. Stud., Duke Univ., Durham, NC 27706]

82-001893 Bellan, G. MANUAL OF METHODS IN AQUATIC ENVIRONMENT RESEARCH. *FAO Fish. Tech. Pap.* No. 208. vii + 31p. 1981. SFA 27(3)
[FAO of the UN, Rome, Italy]

82-001894 Booth, J. H.; G. F. Jansz and G. F. Holeton. $Cl^-$, $K^+$, AND ACID-BASE BALANCE IN RAINBOW TROUT DURING EXPOSURE TO, AND RECOVERY FROM, SUBLETHAL ENVIRONMENTAL ACIDIFICATION. *Can. J. Zool.* 60(5):1123-1130. May 1982. In English with French summ. SFA 27(3)
[Dep. Zool., Univ. Toronto, Toronto, ON M5S 1A1, Canada]

82-001895 Brown, D. J. A. THE EFFECT OF pH AND CALCIUM ON FISH AND FISHERIES. *Water Air Soil Pollut.* 18(1-3):343-351. July, Aug., Sept. 1982. SFA 27(3)
[CERL Freshwater Biol. Unit, Midlands Reg. Sci. Serv. Dep., Ratcliffe-on-Soar, Nottingham, NG11 0EE, England] The combined effect of Ca and pH on fish and fisheries is considered for both laboratory and field studies. It can be seen that at concentrations less than 100 μeq $l^{-1}$, Ca can exert a significant influence on survival times of fish, and similarly in the field, the number of fishless lakes and the number of

## TOXICOLOGY; BIOASSAYS (CONTINUED)

82-001895 CONTINUED fish species found in lakes are less dependent on $H^+$ concentration at low concentrations of Ca than at high Ca levels. The limited historical field data available suggest that alongside any increase there may have been in surface water acidity, Ca concentrations have also increased, and the latter may have offset to some extent the deleterious biological effects of this increased acidity. Nevertheless, details of seasonal and spatial variations in these important water quality factors will need to be considered before a full understanding of the response to adidity of a fishery can be reached.

82-001896 Brown, D. J. A. INFLUENCE OF CALCIUM ON THE SURVIVAL OF EGGS AND FRY OF BROWN TROUT (*SALMO TRUTTA*) AT pH 4.5. *Bull. Environ. Contam. Toxicol.* 28(6):664-668. June 1982. SFA 27(3)
[C.E.R.L. Freshwater Biol. Unit, Midlands Reg. Sci. Serv. Dep., Ratcliffe-on-Soar, Nottingham, NG11 0EE, England]

82-001897 Buckley, J. T.; M. Roch; J. A. McCarter; C. A. Rendell and A. T. Matheson. CHRONIC EXPOSURE OF COHO SALMON TO SUBLETHAL CONCENTRATIONS OF COPPER--I. EFFECT ON GROWTH, ON ACCUMULATION AND DISTRIBUTION OF COPPER, AND ON COPPER TOLERANCE. *Comp. Biochem. Physiol. C Comp. Pharmacol.* 72(1):15-19. 1982. SFA 27(3)
[Dep. Biochem. Microbiol., Univ. Victoria, Victoria, BC V8W 2Y2, Canada]

82-001898 Burgess, J. W. CHRONIC EXPOSURE TO CAFFEINE DURING EARLY DEVELOPMENT MODIFIES SPATIAL BEHAVIOR IN JUVENILE JEWEL FISH SCHOOLS. *Pharmacol. Biochem. Behav.* 17(1):137-140. July 1982. SFA 27(3)
[Mental Retardation Res.Cent., UCLA Sch. Med., 760 Westwood Plaza, Los Angeles, CA 90024] Thirty sibling African jewel fish (*Hemichromis bimaculatus*) were either chronically exposed to caffeine between 50 to 100 days of age (at a concentration of 14 mg/l) or reared without drug in a control environment. After caffeine was withdrawn, fish in each group were videotaped for 30 minutes while schooling in a large tank. From the video record, mean distances and coefficients of variation of spacing were computed for each fish and its 1st to 9th nearest neighbors in all observations. Spacing distances were nearly identical for the two groups, but the caffeine fish exhibited much more variability in their spacing behavior ($P<0.00001$). This study demonstrates an effect on behavior of moderate caffeine levels present throughout the early developmental period, and illustrates a quantitative method to test for such effects.

82-001899 Carmichael, G. J.; B. A. Simco and J. R. Tomasso. EFFECTS OF FORMALIN ON SURVIVAL AND PLASMA COTRICOSTEROID LEVELS IN CHANNEL CATFISH. *Annu. Proc. Tex. Chap. Am. Fish. Soc.* 4:5. 1981[1982]. Abstract only. SFA 27(3)
[Memphis State Univ., Memphis, TN]

82-001900 Dauble, D. D.; W. E. Fallon; R. H. Gray; R. M. Bean; J. B. States. POTENTIAL ECOLOGICAL EFFECTS OF A COAL LIQUID FROM THE SOLVENT REFINED COAL II PROCESS TO AQUATIC ORGANISMS. *Proc. Annu. Conf. West. Assoc. Fish Wildl. Agencies* 61:262-264. 1981. SFA 27(3)
[Pac. Northwest Lab., Ecol. Sci. Dep., Richland, WA 99352]

## TOXICOLOGY; BIOASSAYS (CONTINUED)

82-001901 DeGraeve, G. M.; R. G. Elder; D. C. Woods and H. L. Bergman. EFFECTS OF NAPHTHALENE AND BENZENE ON FATHEAD MINNOWS AND RAINBOW TROUT. *Arch. Environ. Contam. Toxicol.* 11(4):487-490. 1982. SFA 27(3)
[Montreal Eng. Co., Ltd., 500 Beaverbrook Ct., Fredericton, NB E3B 5X4, Canada]

82-001902 Devlin, E. W.; J. D. Brammer and R. L. Puyear. ACUTE TOXICITY OF TOLUENE TO THREE AGE GROUPS OF FATHEAD MINNOWS (*PIMEPHALES PROMELAS*). *Bull. Environ. Contam. Toxicol.* 29(1):12-17. July 1982. SFA 27(3)
[Dep. Zool., N. Dak. State Univ., Fargo 58105]

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82-001904 Ewing, M. S.; S. A. Ewing and M. A. Zimmer. SUBLETHAL COPPER STRESS AND SUSCEPTIBILITY OF CHANNEL CATFISH TO EXPERIMENTAL INFECTIONS WITH *ICHTHYOPHTHIRIUS MULTIFILIIS*. *Bull. Environ. Contam. Toxicol.* 28(6):674-681. June 1982. SFA 27(3)
[Dep. Zool., Okla. State Univ., Stillwater 74078]

82-001905 Folmar, L. C. and H. O. Hodgins. EFFECTS OF AROCLOR 1254 AND NO. 2 FUEL OIL, SINGLY AND IN COMBINATION, ON PREDATOR-PREY INTERACTIONS IN COHO SALMON (*ONCORHYNCHUS KISUTCH*). *Bull. Environ. Contam. Toxicol.* 29(1):24-28. July 1982. SFA 27(3)
[NMFS, 2725 Montlake Blvd. East, Seattle, WA 98112]

82-001906 Freeman, H. C.; G. Sangalang and B. Flemming. THE SUBLETHAL EFFECTS OF A POLYCHLORNATED BIPHENYL (AROCLOR 1254) DIET ON THE ATLANTIC COD (*GADUS MORHUA*). *Sci. Total Environ.* 24(1):1-11. May 1982. SFA 27(3)
[Dep. Fish. Oceans, Halifax Lab., Halifax, NS B3J 2S7, Canada]

82-001907 Garofano, J. S. and H. I. Hirshfield. PERIPHERAL EFFECTS OF CADMIUM ON THE BLOOD AND HEAD KIDNEY IN THE BROWN BULLHEAD (*ICTALURUS NEBULOSUS*). *Bull. Environ. Contam. Toxicol.* 28(5):552-556. May 1982. SFA 27(3)
[Div. Nat. Sci. Math., Bergen Commun. Coll., Paramus, NJ 07652]

82-001908 Gerking, S. D. and R. M. Lee. SURVIVAL AND REPRODUCTION OF THE DESERT PUPFISH (*CYPRINODON N. NEVADENSIS*) AFTER ACCLIMATION TO ACID WATER. *J. Exp. Zool.* 220(3):269-275. 1 May 1982. SFA 27(3)
[Dep. Zool., Ariz. State Univ., Tempe 85281]

82-001909 Giles, M. A. and J. F. Klaverkamp. THE ACUTE TOXICITY OF VANADIUM AND COPPER TO EYED EGGS OF RAINBOW TROUT (*SALMO GAIRDNERI*). *Water Res.* 16(6):885-889. 1982. SFA 27(3)
[Dep. Fish. Oceans, Freshwater Inst., 501 University Crescent, Winnipeg, MB R3T 2N6, Canada] The effects of vanadium (25-595 mg $l^{-1}$) and of copper (0.03-4.78 mg $l^{-1}$) on embryonic survival and hatching of eyed

TOXICOLOGY; BIOASSAYS (CONTINUED)

82-001909 CONTINUED eggs of rainbow trout, *Salmo gairdneri*, were investigated. Copper was approx. 300-fold more toxic than vanadium (96-h $LC_{50}$=0.4 and 118 mg $l^{-1}$, respectively) but had little effect on the timing of hatch. Vanadium induced premature hatching of eyed eggs at concentrations from 44 to 595 mg $l^{-1}$. Concentrations of copper required to produce lethality in eyed eggs were similar to concentrations required to produce mortality in juveniles. Vanadium concentrations approx. 15 times higher were required to produce mortality in eyed eggs than in juveniles. Therefore, acute exposure of eyed rainbow trout eggs to vanadium is not a sensitive toxicity test for use in establishing water quality criteria or maximum acceptable toxicant concentrations.

82-001910 Goodman, L. R.; D. J. Hansen; C. S. Manning and L. F. Faas. EFFECTS OF KEPONE ON THE SHEEPSHEAD MINNOW IN AN ENTIRE LIFE-CYCLE TOXICITY TEST. *Arch. Environ. Contam. Toxicol.* 11(3):335-342. 1982. SFA 27(3)
[U.S. EPA, Environ. Res. Lab., Sabine Island, Gulf Breeze, FL 32561] A life-cycle toxicity test with the estuarine sheepshead minnow (*Cyprinodon variegatus*) and the insecticide Kepone (chlordecone) in seawater showed that the maximum acceptable toxicant concentration (MATC) lies between 0.074 and 0.12μgKepone/L, based on reduced standard length of progeny at 0.12μg/L and higher concentrations. The application factor range (MATC/96-hr LC50) for sheepshead minnows exposed continuously to Kepone is from 0.001 to 0.002. Other adverse effects of Kepone exposure were: External signs of poisoning in fish exposed to concentrations ≥0.074μg/L, fatty degeneration of the liver and histological evidence of vertebral damage in some fish exposed to 0.78μg/L, reduced growth of parental fish at 0.39 and 0.78μg/L, reduced fecundity and fertility of eggs at 0.78μg/L, and reduced survival of embryos produced by fish exposed to 0.78μg/L. Average bioconcentration factors (concentration in tissue÷average measured concentration in water) ranged from 2,600 for 21-day-old juveniles to 7,600 for adult males.

82-001911 Havas, M. and T. C. Hutchinson. AQUATIC INVERTEBRATES FROM THE SMOKING HILLS, N.W.T.: EFFECT OF pH AND METALS ON MORTALITY. *Can. J. Fish. Aquatic Sci.* 39(6):890-903. June 1982. In English with French summ. SFA 27(3)
[Ecol. Syst., Cornell Univ., Ithaca, NY 14853]

82-001912 Hilton, J. W. and D. G. Dixon. EFFECT OF INCREASED LIVER GLYCOGEN AND LIVER WEIGHT ON LIVER FUNCTION IN RAINBOW TROUT, *SALMO GAIRDNERI* RICHARDSON: RECOVERY FROM ANAESTHESIA AND PLASMA $^{35}$S-SULPHOBROMOPHTHALEIN CLEARANCE. *J. Fish Dis.* 5(3):185-195. May 1982. SFA 27(3)
[Dep. Nutr., Coll. Biol. Sci., Univ. Guelph, Guelph, ON N1G 2W1, Canada]

82-001913 Huey, D. W. and T. L. Beitinger. METHEMOGLOBIN LEVELS IN CHANNEL CATFISH, *ICTALURUS PUNCTATUS*, EXPOSED TO NITRITE AND TRICAINE METHANESULFONATE. *Can. J. Fish. Aquatic Sci.* 39(4):643-645. Apr. 1982. In English with French summ. SFA 27(3)
[Dep. Biol. Sci., North Tex. State Univ., Denton 76203]

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82-001914 Kiceniuk, J. W.; R. A. Khan; M. Dave and U. Williams. EXAMINATION OF INTERACTION OF TRYPANOSOME INFECTION AND CRUDE OIL EXPOSURE ON HEMATOLOGY OF THE LONGHORN SCULPIN (*MYOXOCEPHALUS OCTODECEMSPINOSUS*). *Bull. Environ. Contam. Toxicol.* 28(4):435-438. Apr. 1982. SFA 27(3)
[Dep. Fish. Oceans, P.O. Box 5667, St. John's, NF A1G 5X1, Canada]

82-001915 Kodama, M.; T. Ogata and K. Yamamori. HEMOLYSIS OF ERYTHROCYTES OF RAINBOW TROUT *SALMO GAIRDNERI* EXPOSED TO ZINC POLLUTED WATER. *Bull. Jpn. Soc. Sci. Fish.* 48(4):593. Apr. 1982. SFA 27(3)
[Sch. Fish. Sci., Kitasato Univ., Sanriku, Iwate 022-01, Japan]

82-001916 Laitinen, M.; M. Nieminen and E. Hietanen. THE EFFECT OF pH CHANGES OF WATER ON THE HEPATIC METABOLISM OF XENOBIOTICS IN FISH. *Acta Pharmacol. Toxicol.* 51(1):24-29. July 1982. SFA 27(3)
[Dep. Physiol., Univ. Kuopio, P.O. Box 138, SF-70101 Kuopio, Finland]

82-001917 Leatherland, J. F. and R. A. sonstegard. BIOACCUMULATION OF ORGANOCHLORINES BY YEARLING COHO SALMON (*ONCORHYNCHUS KISUTCH* WALBAUM) FED DIETS CONTAINING GREAT LAKES COHO SALMON, AND THE PATHOPHYSIOLOGICAL RESPONSES OF THE RECIPIENTS. *Comp. Biochem. Physiol. C Comp. Pharmacol.* 72(1):91-99. 1982. SFA 27(3)
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82-001918 Lesniak, J. A. and S. M. Ruby. HISTOLOGICAL AND QUANTITATIVE EFFECTS OF SUBLETHAL CYANIDE EXPOSURE ON OOCYTE DEVELOPMENT IN RAINBOW TROUT. *Arch. Environ. Contam. Toxicol.* 11(3):343-352. 1982. SFA 27(3)
[Dep. Biol. Sci., Sir George Williams Campus, Concordia Univ., Montreal, PQ H3G 1M8, Canada]

82-001919 LeValley, M. J. ACUTE TOXICITY OF IODINE TO CHANNEL CATFISH (*ICTALURUS PUNCTATUS*). *Bull. Environ. Contam. Toxicol.* 29(1):7-11. July 1982. SFA 27(3)
[Div. Biol., Kans. State Univ., Manhatten 66506]

82-001920 Limsuwan, C. EVALUATION OF ETOMIDATE AS A FISH ANESTHETIC. *Ph.D. dissertation, Auburn Univ.* 142p. 1981. From Diss. Abst. Int. B Sci. Eng. 42(10):3889. Apr. 1982. SFA 27(3) Etomidate was an effective anesthetic on channel catfish (*Ictalurus punctatus*), golden shiners (*Notemigonus crysoleucas*), and bluegills (*Lepomis macrochirus*). In channel catfish and golden shiners the safety margin (LC50/EC50) for etomidate was 7.6 to 4.0 with exposure of 10 to 80 minutes. The 24-hour LC50 ranged from 0.59 to 2.73 mg/l and toxicity was similar for longer exposure. Water pH and hardness had little effect on toxicity, but toxicity was reduced, anesthesia was more rapid and recovery was quicker at higher temperature. Anesthesia was safely achieved at 2 to 4 mg/l for approximately 30 minutes. Sedation was produced within 15 minutes and maintained for 6 hours at 0.2 to 0.6 mg/l. Etomidate at 2mg/l significantly increased hematocrit, hemoglobin, and total erythrocyte counts, and decreased mean corpuscular hemoglobin and mean corpuscular hemoglobin concentration after 30 minutes of anesthesia. Prolonged exposure to etomidate 0.6mg/l for 96 hours significantly increased plasma glucose and decreased plasma protein concentrations. Etomidate at 4mg/l significantly increased hematocrit and hemoglobin values. Channel catfish anesthetized with 2 mg/l etomidate had hematocrit and hemoglobin concentrations similar to the prestressed level. Etomidate reduced stress as indicated by minimal changes in plasma cortisol, glucose and protein levels during periodic sampling and

## TOXICOLOGY; BIOASSAYS (CONTINUED)

82-001920 CONTINUED netting confinement. No histological changes related to etomidate were observed in livers, gills, trunk kidneys or spleens of channel catfish exposed to high sublethal levels of etomidate for 96 hours.

82-001921 Lovegrove, S. M. and B. Eddy. UPTAKE AND ACCUMULATION OF ZINC IN JUVENILE RAINBOW TROUT, *SALMO GAIRDNERI*. *Environ. Biol. Fishes* 7(3):285-289. 1 June 1982. SFA 27(3)

[F.B. Eddy: Dep. Biol. Sci., Univ. Dundee, Dundee DD1 4HN, U.K.] The toxicity of zinc to rainbow trout was determined and the 72 h median lethal concentration was found to be 2.00 mgl$^{-1}$ in freshwater, hardness 7.50 mg l$^{-1}$ as calcium. An insignificant increase in zinc concentration of internal tissues occurred in fish exposed to 1.52 mg l$^{-1}$ in freshwater for 72 h. However, there was a significant uptake of zinc by gills and the body surface. Fish exposed to 10 mg l$^{-1}$ zinc for 72 h in two-thirds sea water showed significant zinc uptake by liver, rectum and muscle, when compared to control fish. Drinking rate decreased from 1.43 to 0.26 ml kg$^{-1}$h$^{-1}$ when zinc sulphate was added to freshwater. Trout adapted to two-thirds sea water showed no decrease in drinking, about 7 ml kg$^{-1}$h$^{-1}$ when zinc was added to the water.

82-001922 Malins, D. C. ALTERATIONS IN THE CELLULAR AND SUBCELLULAR STRUCTURE OF MARINE TELEOSTS AND INVERTEBRATES EXPOSED TO PETROLEUM IN THE LABORATORY AND FIELD: A CRITICAL REVIEW. *Can. J. Fish. Aquatic Sci.* 39(6):877-889. June 1982. In English with French summ. SFA 27(3)

[NMFS, 2725 Montlake Blvd. East, Seattle, WA 98112]

82-001923 McCarter, J. A.; A. T. Matheson; M. Roch; R. W. Olafson and J. T. Buckley. CHRONIC EXPOSURE OF COHO SALMON TO SUBLETHAL CONCENTRATIONS OF COPPER--II. DISTRIBUTION OF COPPER BETWEEN HIGH- AND LOW-MOLECULAR-WEIGHT PROTEINS IN LIVER CYTOSOL AND THE POSSIBLE ROLE OF METALLOTHIONEIN IN DETOXIFICATION. *Comp. Biochem. Physiol. C Comp. Pharmacol.* 72(1):21-26. 1982. SFA 27(3)

[Dep. Biochem. Microbiol., Univ. Victoria, Victoria, BC V8W 2Y2, Canada]

82-001924 McKim, J. M. and H. M. Goeden. A DIRECT MEASURE OF THE UPTAKE EFFICIENCY OF A XENOBIOTIC CHEMICAL ACROSS THE GILLS OF BROOK TROUT (*SALVELINUS FONTINALIS*) UNDER NORMOXIC AND HYPOXIC CONDITIONS. *Comp. Biochem. Physiol. C Comp. Pharmacol.* 72(1):65-74. 1982. SFA 27(3)

[U.S. EPA, 6201 Congdon Blvd., Duluth, MN 55804]

82-001925 Mukhopadhyay, P. K.; A. P. Mukherji and P. V. Dehadrai. CERTAIN BIOCHEMICAL RESPONSES IN THE AIR-BREATHING CATFISH *CLARIAS BATRACHUS* EXPOSED TO SUBLETHAL CARBOFURAN. *Toxicology* 23(4):337-345. 1982. SFA 27(3)

[Cent. Inland. Fish. Res. Inst., (I.C.A.R.) Barrackpore 743101, W.B. India]

82-001926 Murty, A. S. and A. P. Devi. THE EFFECT OF ENDOSULFAN AND ITS ISOMERS ON TISSUE PROTEIN, GLYCOGEN, AND LIPIDS IN THE FISH *CHANNA PUNCTATA*. *Pestic. Biochem. Physiol.* 17(3):280-286. June 1982. SFA 27(3)

[Inst. Wasser Boden Lufthygiene, Versuchsfeld Marienfelde, Schichauweg 58, D-1000 Berlin 49, West Germany]

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82-001927 Norton, M. G. and F. L. Franklin. RESEARCH INTO TOXICITY EVALUATION AND CONTROL CRITERIA OF OIL DISPERSANTS. *Fish. Res. Tech. Rep. Minist. Agric. Fish. Food (Lowestoft)* No. 57. 20p. 1980. SFA 27(3)
[Fish. Lab., Burnham-on-Crouch, England]

82-001928 Oikari, A.; B. Holmbom and H. Bister. UPTAKE OF RESIN ACIDS INTO TISSUES OF TROUT (*SALMO GAIRDNERI* RICHARDSON). *Ann. Zool. Fenn.* 19(1):61-64. 1982. SFA 27(3)
[Div. Physiol., Dep. Zool., Univ. Helsinki, Arkadiankatu 7, SF-00100 Helsinki 10, Finland]

82-001929 Pandey, K. and J. P. Shukla. DELETERIOUS EFFECTS OF ARSENIC ON THE GROWTH OF FINGERLINGS OF A FRESHWATER FISH, *COLISA FASCIATUS* (BL. & SCH.) *Acta Pharmacol. Toxicol.* 50(5):398-400. May 1982. SFA 27(3)
[Dep. Zool., Gorakhpur Univ., Gorakhpur-273001, India]

82-001930 Phipps, G. L.; G. W. Holcombe and J. T. Fiandt. SATURATOR SYSTEM FOR GENERATING TOXIC WATER SOLUTIONS FOR AQUATIC BIOASSAYS. *Prog. Fish-Cult.* 44(2):115-116. Apr. 1982. SFA 27(3)
[U.S. EPA, 6201 Congdon Blvd., Duluth, MN 55804]

82-001931 Sasaki, K.; T. Suzuki; M. Takeda and M. Uchiyama. BIOCONCENTRATION AND EXCRETION OF PHOSPHORIC ACID TRIESTERS BY KILLIFISH (*ORYZIAS LATIPES*). *Bull. Environ. Contam. Toxicol.* 28(6):752-759. June 1982. SFA 27(3)
[Natl. Inst. Hygienic Sci., 18-1 Kamiyoga, 1-chome, Setagaya-ku, Tokyo, Japan]

82-001932 Seikai, T. [ACUTE TOXICITY OF ORGANOPHOSPHOROUS INSECTICIDES ON THE DEVELOPMENTAL STAGES OF EGGS, LARVAE AND JUVENILES OF JAPANESE STRIPED KNIFEJAW *OPLEGNATHUS FASCIATUS*.] *Bull. Jpn. Soc. Sci. Fish.* 48(5):599-603. May 1982. In Japanese with English summ. SFA 27(3)
[Fish. Res. Stn., Kyoto Univ., Mizuru, Kyoto 625, Japan]

82-001933 Sharma, D. C.; P. S. Davis and P. K. Sharma. EFFECT OF ASCORBIC ACID ON BIOTRANSFORMATION AND MODIFICATION OF THE TOXICITY OF MERCURIALS IN GOLDFISH (*CARASSIUS AURATUS*). *Experientia (Basel)* 38(5):565-567. 15 May 1982. SFA 27(3)
[Dep. Biochem., J.L.N. Med. Coll., Ajmer, India]

82-001934 Sharp, J. R. and J. M. Neff. THE TOXICITY OF MERCURIC CHLORIDE AND METHYLMERCURIC CHLORIDE TO *FUNDULUS HETEROCLITUS* EMBRYOS IN RELATION TO EXPOSURE CONDITIONS. *Environ. Biol. Fishes* 7(3):277-284. 1 June 1982. SFA 27(3)
[Dep. Biol., Southeast Mo. State Univ., Cape Girardeau 63701]

82-001935 Shea, T. B. and E. S. Berry. UPTAKE AND TOXICITY OF TOXAPHENE TO CELL CULTURES DERIVED FROM GOLDFISH (*CARASSIUS AURATUS*). *Bull. Environ. Contam. Toxicol.* 29(1):68-75. July 1982. SFA 27(3)
[Dep. Biol., Northeastern Univ., Boston, MA 02115]

## TOXICOLOGY; BIOASSAYS (CONTINUED)

82-001936 Singh, S. M. and P. M. Sivalingam. *IN VITRO* STUDY ON THE INTERACTIVE EFFECTS OF HEAVY METALS ON CATALASE ACTIVITY OF *SAROTHERODON MOSSAMBICUS* (PETERS). *J. Fish Biol.* 20(6):683-688. June 1982. SFA 27(3)
[Sch. Biol. Sci., Univ. Sci. Malaysia, Penang, Malasia]

82-001937 Stagg, R. M. and T. J. Shuttleworth. THE ACCUMULATION OF COPPER IN *PLATICHTHYS FLESUS* L. AND ITS EFFECTS ON PLASMA ELECTROLYTE CONCENTRATIONS. *J. Fish Biol.* 20(4):491-500. Apr. 1982. SFA 27(3)
[Dep. Biol. Sci., Hatherly Lab., The University, Prince of Wales Rd., Exeter, Devon, EX4 4PS, England] Copper was shown to accumulate in the gills, liver, kidney and plasma of seawater-adapted and freshwater-adapted *Platichthys flesus* exposed to elevated ambient concentrations of the metal. Exposure to sublethal concentrations of copper also caused deviations from control values, of the plasma ions sodium and chloride, indicative of impaired ion regulatory capacity.

82-001938 Topping, G. REPORT ON THE 6TH ICES TRACE METAL INTERCOMPARISON EXERCISE FOR CADMIUM AND LEAD IN BIOLOGICAL TISSUE. *Int. Counc. Explor. Sea Coop. Res. Rep.* No. 111. 27p. Feb. 1982. SFA 27(3)
[Int. Counc. Explor. Sea, Palaegade 2-4, 1261 Copenhagen K, Denmark]

82-001939 Tort, L.; S. Crespo and J. Balasch. OXYGEN CONSUMPTION OF THE DOGFISH GILL TISSUE FOLLOWING ZINC TREATMENT. *Comp. Biochem. Physiol. C Comp. Pharmacol.* 72(1):145-148. 1982. SFA 27(3)
[Fisiol. Anim., Fac. Cienc., Univ. Auto. Barcelona, Barcelona, Spain]

82-001940 Wong, P. T. S.; Y. K. Chau; O. Kramar and G. A. Bengert. STRUCTURE-TOXICITY RELATIONSHIP OF TIN COMPOUNDS ON ALGAE. *Can. J. Fish. Aquatic Sci.* 39(3):483-488. Mar. 1982. In English with French summ. SFA 27(3)
[Can. Cent. Inland Waters, Burlington, ON L7R 4A6, Canada]

82-001941 Woodhead, A. D.; R. B. Setlow and V. Pond. EFFECTS OF POLYCYCLIC AROMATIC HYDROCARBONS ON THE PROLIFERATION OF ECTOPIC THYROID TISSUE IN *POECILIA FORMOSA*, THE AMAZON MOLLY. *J. Fish Biol.* 20(4):455-463. Apr. 1982. SFA 27(3)
[Biol. Dep., Brookhaven Natl. Lab., Upton, NY 11970] A single intraperitoneal injection of any one of several polycylic aromatic hydrocarbons given to young Amazon mollies induces massive enlargement of the spleen. This enlargement is the result of splenic tissue being partially or wholly replaced by proliferating thyroid tissue. The pharyngeal thyroid gland is stimulated but to a lesser degree. No exuberant thyroid tissue is found at any other extrapharyngeal site. We discuss the possible causes of this finding.

82-001942 Yamagata, Y. and M. Niwa. [ACUTE AND CHRONIC TOXICITY OF AMMONIA TO EEL *ANGUILLA JAPONICA*.] *Bull. Jpn. Soc. Sci. Fish.* 48(2):171-176. Feb. 1982. In Japanese with English summ. SFA 27(3)
[Mie Pref. Freshwater Fish. Exp. Stn., Komono, Mie, Mie 510-12, Japan] The lethal effect and growth suppressing effect of ammonia on eel *Anguilla japonica* were examined. The 24h-$LC_{50}$ of total ammonia estimated to be 2844 mg/*l* at pH 5, 820 mg/*l* at pH 7 and 16.8 mg/*l* at pH 9. Estimated concentrations of unionized ammonia nitrogen in the culture media containing total ammonia nitrogen at the level of 24 h-$LC_{50}$ are

## TOXICOLOGY; BIOASSAYS (CONTINUED)

82-001942 CONTINUED almost constant (4.6-6.0 mg/*l*) in the pH range from 8 to 9. This fact suggests that an unionized ammonia alone is responsible for the toxicity of ammonia in the pH range, however, in the range of pH from 5 to 7, estimated concentration of unionized ammonia decreased with decreasing pH. Thus, at the pH lower than 7, ionized ammonia must have shown toxicity for the eel together with unionized ammonia. In the chronic toxicity study at pH 6.8 for weeks at 25°C, concentration of more than 01067 mg/*l* of unionized ammonia nitrogen suppressed the growth of eel significantly ($P<0.05$). The limit of safe concentration of unionized ammonia nitrogen for the growth of eel was estimated to be 0.034 mg/*l*. Exposure of fish to unionized ammonia nitrogen for 9 weeks resulted in the increase of erythrocyte number at the concentration of more than 0.067 mg/*l*, and histological as well as pathological changes were observed in the gill tissue at the concentration of 0.121 and 0.228 mg/*l*.

## FISH TOXICANTS

82-001943 Dawson, V. K. A RAPID HIGH-PERFORMANCE LIQUID-CHROMATOGRAPHIC METHOD FOR SIMULTANEOUSLY DETERMINING THE CONCENTRATIONS OF TFM AND BAYER 73 IN WATER DURING LAMPRICIDE TREATMENTS. *Can. J. Fish. Aquatic Sci.* 39(5):778-782. May 1982. In English with French summ. SFA 27(3)
[U.S. FWS, P.O. Box 818, La Crosse, WI 54601]

## RESEARCH AND MANAGEMENT-GENERAL

82-001944 Bergman, P. K. APPROACHES TO COMPLEX SALMON ENHANCEMENT/FISHERY ISSUES: THE WASHINGTON EXPERIENCE. *Proc. Annu. Conf. West. Assoc. Fish Wildl. Agencies* 61:208-211. 1981. SFA 27(3)
[Wash. Dep. Fish., Olympia]

82-001945 FAO of the UN. REPORT OF THE WORKING PARTY ON THE PROMOTION OF FISHERY RESOURCES RESEARCH IN DEVELOPING COUNTRIES. *FAO Fish. Rep.* No. 251. x + 135p. 1981. In English, French and Spanish. SFA 27(3)
[Rome, Italy]

82-001946 FAO of the UN. REPORT OF THE FOURTEENTH SESSION OF THE COMMITTEE ON FISHERIES. *FAO Fish. Rep.* No. 256p. x + 33p. 1981. SFA 27(3)
[Rome, Italy]

82-001947 Gerking, S. D. THE CHANGING CHARACTER OF FISHERY BIOLOGY. *Fisheries (Bull. Am. Fish. Soc.)* 7(3):5-8. May-June. 1982. SFA 27(3)
[Dep. Zool., Ariz. State Univ., Tempe]

82-001948 Holubetz, T. COLUMBIA RIVER BASIN SALMON AND STEELHEAD MANAGMENT FRAMEWORK PLAN. *Proc. Annu. Conf. West. Assoc. Fish Wildl. Agencies* 61:265-269. 1981. Summary only. SFA 27(3)

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82-001949 Webster, D. A. EARLY HISTORY OF THE ATLANTIC SALMON IN NEW YORK. *N.Y. Fish Game J.* 29(1):26-44. Jan. 1982. SFA 27(3)
[Dep. Nat. Resour., Cornell Univ., Ithaca, NY 14853] The early abundance of Atlantic salmon in New York waters draining into eastern lake Ontario is attested in the accounts of 17th, 18th and early 19th century observers. Of particular interest is the journal kept by DeWitt Clinton in 1810 during his trip by boat up the Mohawk River and down the Oswego River to inspect the route of the contemplated Erie Canal. Illustrative excerpts from this and other accounts are compiled together with comments by the present author in the light of current knowledge. Information concerning salmon in Lake Champlain and the Hudson River is also included.

## REPORTS OF FISHERY STATIONS, STATES, ETC.

82-001950 Freshwater Biological Association. FIFTIETH ANNUAL REPORT. *Freshwater Biol. Assoc. Annu. Rep.* 50. 136p. 1982. SFA 27(3)
[The Ferry House, Ambleside, Cumbria LA22 0LP, England]

82-001951 Osborn, M. F. AN OVERVIEW OF THE COASTAL FISHERIES BRANCH OF THE TEXAS PARKS AND WILDLIFE DEPARTMENT. *Annu. Proc. Tex. Chap. Am. Fish. Soc.* 4:6-7. 1981[1982]. Abstract only. SFA 27(3)
[Tex. Parks Wildl. Dep., 4200 Smith School Rd., Austin 78744]

82-001952 Pacific Marine Fisheries Commission. THIRTY-FOURTH ANNUAL REPORT OF THE PACIFIC MARINE FISHERIES COMMISSION FOR THE YEAR 1981. *Pac. Mar. Fish. Comm. Annu. Rep.* 34. 1-47. 1 June 1982. SFA 27(3)
[528 S.W. Mill St., Portland, OR 97201]

## HABITAT ALTERATIONS

82-001953 Babcock, W. H. TENMILE CREEK--A STUDY OF STREAM RELOCATION. *Colo. Div. Wildl. Spec. Rep.* No. 52. vi + 22p. Apr. 1982. SFA 27(3)
[Colo. Div. Wildl., 317 W. Prospect, Fort Collins 80526] After input from various interested agencies, three miles of creek were relocated to facilitate the construction of Interstate 70 through Tenmile Canyon west of Denver. The 0.5 million dollar project was designed to provide fish habitat of equal value to that present before construction or, if possible, to improve this habitat. Construction techniques were designed to minimize damage to flora and fauna. After the channels were excavated, rock and log fish habitat structures were constructed. Two years after construction, a 4 percent chance flood occurred at the project area which made almost 75 percent of the habitat structures ineffective. Pool-riffle ratios and quantity and quality of spawning areas remained essentially unchanged throughout the period. Population estimates indicated an increase in the number of fish in the postconstruction period compared to preconstruction numbers. Fish biomass estimates for the project area were comparable for the two periods. Aquatic invertebrate populations were unchanged as indicated by comparison of three pre- and postconstruction indices.

## HABITAT ALTERATIONS (CONTINUED)

82-001954 Bergersen, E. P. and M. Maiolie. COLORADO COOPERATIVE FISHERY RESEARCH UNIT STUDIES AT TWIN LAKES, COLORADO: 1980 REPORT OF FINDINGS. *U.S. Dep. Interior Bur. Reclam. Eng. Res. Cent. Rep.* No. REC-ERC-82-8. vii + 59p. Dec. 1981. SFA 27(3)

[Colo. Coop. Fish. Res. Unit, Colo. State Univ., Fort Collins 80523]

82-001955 Bobbitt, J. and S. Akenhead. INFLUENCE OF CONTROLLED DISCHARGE FROM THE CHURCHILL RIVER ON THE OCEANOGRAPHY OF GROSWATER BAY, LABRADOR. *Can. Tech. Rep. Fish. Aquatic Sci.* No. 1097. iv + 43p. May 1982. SFA 27(3)

[Oceans Ltd., P.O. Box 13398, St. John's, NF A1B 4B7, Canada]

82-001956 Harrington, R. W., Jr. and E. S. Harrington. EFFECTS ON FISHES AND THEIR FORAGE ORGANISMS OF IMPOUNDING A FLORIDA SALT MARSH TO PREVENT BREEDING BY SALT MARSH MOSQUITOES. *Bull. Mar. Sci.* 32(2):523-531. Apr. 1982. SFA 27(3)

[Fla. Med. Entomol. Lab., P.O. Box 520, Vero Beach 32960]

82-001957 Hilton, J. and G. L. Phillips. THE EFFECT OF BOAT ACTIVITY ON TURBIDITY IN A SHALLOW BROADLAND RIVER. *J. Appl. Ecol.* 19(1):143-150. Apr. 1982. SFA 27(3)

[Freshwater Biol. Assoc., Windemere, Cumbria, England] Measurements of water turdidity and boat movements were made on a shallow Broadland River, the River Ant, above and below Barton Broad. A simple experimental model of the form $y = a + be^{kt}$ was proposed and tested. It describes the mechanism by which boats can influence turbidity. Of three constants derived from the model, two were shown to be closely related to measured physical variables. The model was used to predict water turbidities from typical boat movement patterns. This demonstrated that long-term build-up of boat induced turbidity through the holiday season was unlikely and that the major part of the turbidity in below Barton Broad on the River Ant was due to algae, not to boating activity.

82-001958 Hunt, R. L. AN EVALUATION OF HALF-LOGS TO IMPROVE BROWN TROUT HABITAT IN EMMONS CREEK. *Wis. Dep. Nat. Resour. Res. Rep.* No. 116. 8p. May 1982. SFA 27(3)

[Wis. Dep. Nat. Resour., Bur. Res., Waupaca] Sixty half-log structures were installed on Emmons Creek, Waupaca County, in a 0.19-mile-long Treatment Zone in April 1978. The wild brown trout (*Salmo trutta*) populations in this zone and in an adjacent upstream Reference Zone (0.34-mile-long) were monitored with electrofishing gear 5 times prior to installation and 6 times thereafter to assess benefits of half-logs to trout carrying capacity. The number of trout in spring and fall, total biomass, number of legal sized trout (6 inches) and number over 10 inches were the four population characteristics focused on to detect response. Only the number of trout over 10 inches in October showed a positive postinstallation change that may have been influenced by half-logs in the Treatment Zone. Other characteristics of the trout population in the Treatment Zone varied seasonally and year to year seemingly independent of the addition of half-logs. Angler harvest, both legal and illegal, was speculated to have increased during the postinstallation period which could have negated, in part, increases in the number and biomass of trout that might have occurred if angling mortality had not increased. Only 1 of the 60 half-logs failed to function at least partially as expected. Average functional utility based on measurements made 48 months after installation was 83%.

HABITAT ALTERATIONS (CONTINUED)

82-001959 LaBounty, J. F. and J. J. Sartoris. STUDIES OF THE EFFECTS OF OPERATING THE MT. ELBERT PUMPED-STORAGE POWERPLANT ON TWIN LAKES, COLORADO: 1980 REPORT OF FINDINGS. *U.S. Dep. Interior Bur. Reclam. Eng. Res. Cent. Rep.* No. REC-ERC-82-7. iii + 56p. Dec. 1981. SFA 27(3)
[U.S Bur. Reclam., Eng. Res. Cent., Denver, CO]

82-001960 Moring, J. R. DECREASE IN STREAM GRAVEL PERMEABILITY AFTER CLEAR-CUT LOGGING: AN INDICATION OF INTRAGRAVEL CONDITIONS FOR DEVELOPING SALMONID EGGS AND ALEVINS. *Hydrobiologia* 88(3):295-298. 9 Apr. 1982. SFA 27(3)
[Me. Coop. Fish. Res. Unit, Dep. Zool., Univ. Me., Orono 04469] Average gravel permeabilities decreased significantly in an Oregon, U.S.A., stream after 82% of the drainage basin was clear-cut. Patterns remained statistically normal in a stream of an unlogged drainage basin and in a stream in a drainage area that was 25% clear-cut, but with riparian buffer strips about 30 m wide left along the stream. It is cautioned that decreases in yearly permeability values can reflect adverse intragravel conditions for developing salmonid eggs and alevins, even if the environmental changes, particularly the amount of sediment fines in gravel, are not as apparent.

82-001961 Nesler, T. P. TWIN LAKES STUDIES: A CHARACTERIZATION OF THE TWIN LAKES FISHERY VIA CREEL CENSUS WITH AN EVALUATION OF POTENTIAL EFFECTS OF PUMPED-STORAGE POWER GENERATION. *U.S. Dep. Interior Bur. Reclam. Eng. Res. Cent. Rep.* No. REC-ERC-82-4. vii + 48p. Nov. 1981. SFA 27(3)
[Colo. Div. Wildl., 317 W. Prospect, Fort Collins 80526]

82-001962 Peters, J. C. EFFECTS OF RIVER AND STREAMFLOW ALTERATION ON FISHERY RESOURCES. *Fisheries (Bull. Am. Fish. Soc.)* 7(2):20-22. Mar.-Apr. 1982. SFA 27(3)
[Bur. Reclam., Environ. Affr. Off., Eng. Res. Cent., Denver, CO]

82-001963 Schwille, E. M. BENEFICIAL FISH AND WILDLIFE FEATURES IN FLOODWATER RETARDING STRUCTURES. *Annu. Proc. Tex. Chap. Am. Fish. Soc.* 4:18. 1981[1982]. Abstract only. SFA 27(3)
[U.S. Soil Conserv. Serv., Terrell, TX]

82-001964 Seehorn, M. E., (compiler). PROCEEDINGS OF THE TROUT STREAM HABITAT IMPROVEMENT WORKSHOP. *Proc. Trout Stream Habitat Improvement Workshop* iv + 158p. 1980(1982). Available from U.S. For. Serv., 1720 Peachtree Rd., NW, Atlanta, GA 30367]

82-001965 Simons, D. B.; R. M. Li; P. Lagasse and R. T. Milhous. PROCEEDINGS: WORKSHOP ON DOWNSTREAM RIVER CHANNEL CHANGES RESULTING FROM DIVERSIONS OR RESERVOIR CONSTRUCTION. *U.S. Fish. Wildl. Serv.* FWS/OBS-91/48. v + 347p. Sept. 1982. SFA 27(3)
[Colo. State Univ., Fort Collins 80523]

82-001966 Storck, T. W.; D. W. Dufford and W. U. Brigham. THE EFFECTS OF RESERVOIR WATER LEVEL FLUCTUATION ON UTILIZATION OF A SMALL TRIBUTARY STREAM BY STREAM AND RESERVOIR FISH POPULATIONS. *Trans. Ill. State Acad. Sci.* 74(1-2):147-155. 1981. SFA 27(3)
[Ill. Nat. Hist. Surv., R.R. 1, Box 157, Sullivan 61951] Six stations on Whitley Creek were sampled with a boat shocker and seines in years of

## HABITAT ALTERATIONS (CONTINUED)

82-001966 CONTINUED moderate and high reservoir water level fluctuation. Stations were chosen to provide for the sampling of impounded and lotic habitats. Physical alteration of stream habitat caused by silting, and population pressure exerted by the influx of reservoir species into impounded areas were temporary. Stream species quickly recolonized impounded areas when these areas reverted to stream conditions and reservoir species did not persist in stream habitat. Large areas of Whitley Creek impounded by high water in the spring and summer of 1974 served as nursery areas for many reservoir species. The young-of-the-year produced in this habitat apparently returned to the reservoir in autumn and may have contributed to the recruitment of reservoir populations.

## HARVEST, CREEL CENSUS, ETC.

82-001967 FAO of the UN. 1980 YEARBOOK OF FISHERY STATISTICS, CATCHES AND LANDINGS. VOL. 50. *FAO Fish. Ser.* 16. x + 386p. 1981. In English, French and Spanish. SFA 27(3)
[Rome, Italy]

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[Dep. Agric. Resour. Econ., Univ. Me., Orono]

82-001969 Samples, K. C. ESTIMATING RECREATIONAL FISHING BENEFITS USING A LOGIT MODEL. *Proc. Annu. Conf. West. Assoc. Fish Wildl. Agencies* 61:170-180. 1981. SFA 27(3)
[Dep. Agric. Resour. Econ., Univ. Hawaii, Manoa]

82-001970 Wespestad, V. G. and J. M. Terry. A PRELIMINARY BIOECONOMIC MODEL OF THE POLLOCK FISHERY IN THE EASTERN BERING SEA. *Proc. Annu. Conf. West. Assoc. Fish Wildl. Agencies* 61:200-204. 1981. SFA 27(3)
[NMFS, 2725 Montlake Blvd. East, Seattle, WA 98112]

## REGULATIONS

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[Oceanogr. Dep., Dalhousie Univ., Halifax, NS B3H 4J1, Canada]

82-001972 Mikel, H. C. APPLICATION OF DETERRENTS TO REDUCE FISHING VIOLATIONS. *Proc. Annu. Conf. West. Assoc. Fish Wildl. Agencies* 61:246-249. 1981. SFA 27(3)
[N. Mex. Dep. Game Fish, Santa Fe]

## MARKING AND TAGGING

82-001973 Arnason, A. N.; C. R. Krasey and K. H. Mills. A COMPUTER PROGRAM FOR PREDICTING PRECISION AND TAG-LOSS BIAS IN JOLLY-SEBER MARK-RECAPTURE ESTIMATES. *Can. Tech. Rep. Fish. Aquatic Sci.* No. 1083. iv + 42p. June 1982. In English with French summ. SFA 27(3)
[Dep. Fish. Oceans, Winnipeg, MB R3T 2N6, Canada]

82-001974 Cheeseman, C. L. and R. B. Mitson, (eds.). TELEMETRIC STUDIES OF VERTEBRATES. *Symp. Zool. Soc. Lond.* No. 49. xix + 368p. 1982. SFA 27(3)
A collection of papers.--PS

82-001975 Hankin, D. G. ESTIMATING ESCAPEMENT OF PACIFIC SALMON: MARKING PRACTICES TO DISCRIMINATE WILD AND HATCHERY FISH. *Trans. Am. Fish. Soc.* 111(3):286-298. May 1982. SFA 27(3)
[Dep. Fish., Humboldt State Univ., Arcata, CA 95521]

82-001976 Jenkinson, D. W. and H. T. Bilton. ADDITIONAL GUIDELINES TO MARKING AND CODED WIRE TAGGING OF JUVENILE SALMON. *Can. Tech. Rep. Fish. Aquatic Sci.* No. 1051. iv + 24p. Dec. 1981. In English with French summ. SFA 27(3)
[Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada]

82-001977 Krieger, K. J. TAGGING HERRING WITH CODED-WIRE MICROTAGS. *Mar. Fish. Rev.* 44(3):18-21. Mar. 1982. SFA 27(3)
[NMFS, P.O. Box 155, Auke Bay, AK 99821]

82-001978 McAfee, M. E. FLUORESCENT PIGMENT SPRAY-MARKING: DO WE KNOW WHERE WE STAND? *Proc. Annu. Conf. West. Assoc. Fish Wildl. Agencies* 61:270-272. 1981. SFA 27(3)
[Colo. Div. Wildl., Grand Junction]

82-001979 Zimmermann, F. and C. Bercy. EFFETS DE LA FIXATION INTERNE D'ÉMETTEURS DE TRACKING CHEZ LA TRUITE. [EFFECTS OF INTERNAL TRACKING TRANSMITTERS ON BEHAVIOUR OF TROUTS.] *Acta Oecol. Oecol. Appl.* 2(1):49-62. 1981. In French with English summ. SFA 27(3)
[Lab. Geophys. Appl., Univ. Paris VI, 4, place Jussieu, 75230 Paris Cedex 05, France] The authors have reviewed the different ways of fixing tracking transmitters on fish. Then they studied abdominal surgical implantation. Sixty trouts (average weight 525 g(*s*= 143)) were equipped with dummy transmitters of various characteristics: Length: 2, 4, 6, 8 cm. Weight: 0, 3, 5, 6, 9, 10, 15 g (in water). Diameter: 12 mm. After their operation trouts were hold 15 days in a tank. Each fish was observed 12 minutes in a day. Different criteria were used to study fish perturbation: Spontaneous activity, growth, number of avoidance and pursuits, time during which the fish stayed motionless on bottom: we computed the correlation of these different criteria on transmitter weight and length. It appeared that transmitter weight caused a significant decrement in the three first criteria and transmitter length in spontaneous activity only. Survival rate was 75%. X-ray photographs revealed some displacements of the transmitter: it often staid at the rear end of the body cavity. Hydrostatic equilibrium was regained only actively: there was no compensation of extratransmitter weight by fish density variation. Histological study revealed that tissues in

## MARKING AND TAGGING (CONTINUED)

82-001979 CONTINUED contact with transmitter (peritoneum) showed a proliferation reaction and heavy vascularisation.

## STOCKING AND INTRODUCTIONS

82-001980 Bilton, H. T. RETURNS OF ADULT COHO SALMON FROM RELEASES OF ACCELERATED AND NORMALLY REARED JUVENILES. *Can. Tech. Rep. Fish. Aquatic Sci.* No. 1054. iv + 22p. Feb. 1982. In English with French summ. SFA 27(3)
[Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada] In the fall of 1976, and the fall of 1977, two groups of coho differing only in method of incubation were accelerated at Rosewall Creek. On June 24-27, 1977, 10,786 marked and nose-tagged 9.9-g accelerated smolts were released from Rosewall Creek. Of these 4,187 were held in Heath-type trays, the remaining 6,599 were held in Heath-type try as until the "eyed" stage and then transferred to gravel incubation boxes. The total return (escapement and fishery) was 2.48%. There was no difference in the returns from the two sub-groups that had different incubation histories. On June 23, 1978, 13,271 marked and nose-tagged 14.6-g accelerated smolts were released along with 9,892 normally reared (14-mo) 13.1 g, nose-tagged coho. Of these, 3,574 of the normally reared juveniles, were held in Heath-type trays, and the remaining 6,318 were held in Heath-type trays until the "eyed" stage and then transferred to gravel incubation boxes. The return (escapement and fishery) of accelerated fish was 0.60%, that from the normally reared fish was 4.38%. There was no difference in the returns from the two sub-groups that had different incubation histories. The overall return of adults from normal smolts released in the same year as the accelerated smolts (1978) was 7.3 times normally reared smolts was far below the return expected for fish of that size released on that date. The returns from the two accelerated releases were much lower than the average return of 25% expected for normally reared smolts released from B.C. production hatcheries. The data are suggestive that zero-age smolts, as currently produced, may prove ineffective as a means of building up stocks of coho salmon through hatchery manipulation.

82-001981 Bilton, H. T.; D. F. Alderdice and J. T. Schnute. INFLUENCE OF TIME AND SIZE AT RELEASE OF JUVENILE COHO SALMON (*ONCORHYNCHUS KISUTCH*) ON RETURNS AT MATURITY. *Can. J. Fish. Aquatic Sci.* 39(3):426-447. Mar. 1982. In English with French summ. SFA 27(3)
[Dep. Fish. Oceans, Resour. Serv. Br., Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada]

## FISHING GEAR AND TECHNIQUES

82-001982 Bishop, C. A. COD TRAP MESH SELECTION STUDIES. *Can. Tech. Rep. Fish. Aquatic Sci.* No. 1075. iv + 47p. Mar. 1982. In English with French summ. SFA 27(3)
[Dep. Fish. Oceans, P.O. Box 5667, St. John's, NF A1C 5X1, Canada]

82-001983 Brenner, B. C. and R. L. Noble. SEINING AND ELECTROFISHING AS INDICES OF LARGEMOUTH BASS ABUNDANCE. *Annu. Proc. Tex. Chap. Am. Fish. Soc.* 4:94. 1981[1982]. Abstract only. SFA 27(3)
[Dep. Wildl. Fish. Sci., Tex. A&M Univ., College Station]

## FISHING GEAR AND TECHNIQUES (CONTINUED)

82-001984 Cada, G. F. and J. M. Loar. RELATIVE EFFECTIVENESS OF TWO ICHTHYOPLANKTON SAMPLING TECHNIQUES. *Can. J. Fish. Aquatic Sci.* 39(6):811-814. June 1982. In English with French summ. SFA 27(3)
[Environ. Sci. Div., Oak Ridge Natl. Lab., Oak Ridge, TN 37830]

82-001985 Craig, J. F. and J. M. Fletcher. THE VARIABILITY IN THE CATCHES OF CHARR, *SALVELINUS ALPINUS* L., AND PERCH, *PERCA FLUVIATILIS* L., FROM MULTI-MESH GILL NETS. *J. Fish Biol.* 20(5):517-526. May 1982. SFA 27(3)
[Freshwater Biol. Assoc., Windermere Lab., Ambleside, Cumbria LA22 0LP, England] Multi-mesh gill nets set a Rawlinson's Nab in the south basin of Windermere for 24 months from 1979 to 1981 caught predominantly charr and perch. Nets set parallel to the shore caught significantly fewer fish than those set perpendicular to the shore. Variability in the mean catches of perch increased from winter to summer when the size of the catches also increased. Charr were mostly caught from November until February. Estimates of variance associated with the geometric mean catch of a single net (set perpendicular to the shore) were calculated for the periods winter for the charr and winter, summer, spring and autumn for the perch. These variances were used to calculate 95 and 99% C.L. of the geometric mean. For limits to be below half or twice the geometric mean, 12 nets would have to be used for charr during winter. For perch the number of nets needed would be six in winter, 20 in spring and autumn and 40 in summer. It is concluded that the nets are of little value in assessing changes in stock abundance.

82-001986 Eggers, D. M.; N. A. Rickard; D. G. Chapman and R. R. Whitney. A METHODOLOGY FOR ESTIMATING AREA FISHED FOR BAITED HOOKS AND TRAPS ALONG A GROUND LINE. *Can. J. Fish. Aquatic Sci.* 39(3):448-453. Mar. 1982. In English with French summ. SFA 27(3)
[Fish. Res. Inst., Sch. Fish., Univ. Wash., Seattle 98195]

82-001987 Hubert, W. A. and D. N. Schmitt. FACTORS INFLUENCING HOOP NET CATCHES IN CHANNEL HABITATS OF POOL 9, UPPER MISSISSIPPI RIVER. *Proc. Iowa Acad. Sci.* 89(2):84-88. June 1982. SFA 27(3)
[Iowa Coop. Fish. Res. Unit, Iowa State Univ., Ames 50011] The catch per unit of effort and species selectivity of two hoop net types fished in channel habitats of Pool 9 were described. Variation in catch was noted between the two net types, as well as between sampling areas and channel types. The total catch with bait nets was 580 fish in the main channel border and 539 in side channels, while buffalo nets captured 1,213 fish from the main channel border and 1,004 from side channels with the same amount of fishing effort. Six species comprised 93% of the bait net samples: shorthead redhorse, black crappie, freshwater drum, flathead catfish, bluegill, and channel catfish. The six most abundant species in buffalo nets were: shorthead redhorse, freshwater drum, smallmouth buffalo, mooneye, bluegill, and common carp. Species collected in greater numbers in main channel border habitats were: gizzard shad, mooneye, quillback, white sucker, smallmouth buffalo, bigmouth buffalo, channel catfish, flathead catfish, and black crappie. Side channels produced greater numbers of common carp, shorthead redhorse, and bluegill. Multiple regression analysis showed that variation in water temperature, current velocity, turbidity, dissolved oxygen, channel type, and sampling area accounted for variation in the catch of several fish species. Turbidity was the most common variable to be related to catch and tended to have a negative relationship.

## FISHING GEAR AND TECHNIQUES (CONTINUED)

82-001988 Main, J. and G. I. Sangster. A STUDY OF THE FISH CAPTURE PROCESS IN A BOTTOM TRAWL BY DIRECT OBSERVATIONS FROM A TOWED UNDERWATER VEHICLE. *Scott. Fish. Res. Rep.* No. 23. 23p. 1981. SFA 27(3)
[Mar. Lab., Aberdeen, Scotland]

82-001989 Matlock, G. C.; J. E. Weaver and A. W. Green. SAMPLING NEARSHORE ESTUARINE FISHES WITH ROTENONE. *Trans. Am. Fish. Soc.* 111(3):326-331. May 1982. SFA 27(3)
[Coast. Fish. Br., Tex. Parks Wildl. Dep., 4200 Smith School Rd., Austin 78744]

82-001990 Pati, S. OBSERVATIONS ON THE EFFECT OF TROPICAL CYCLONES ON GILLNETTING IN THE BAY OF BENGAL. *J. Cons. Cons. Int. Explor. Mer* 40(1):62-66. Feb. 1982. SFA 27(3)
[Dep. Zool., Ravenshaw Coll., Cuttack 753003, Orissa, India] Cyclones originating in the Bay of Bengal invariably hit Orissa and adjacent coasts during peak fishing seasons. The impact of these storms on a coastal fishery was studied for the first time in Indian waters. The investigation covered a period of seven years from 1969 to 1976. The effect of a storm on a coastal gillnet fishery depends upon the wind velocity, the direction of the storm track and its distance from the fishing area, and the coastal configuration. A "direct hit" on the fishing area always reduced the catch for the next 14 days, irrespective of the intensity of the wind. Severe cyclonic storms passing the fishing area within a radius of 400 km reduced the catch. A milder storm passing beyond a range of 100 km increased the catch in the following 14 days. Out of 10 cyclones for which landing data were available, six had adverse effect on gillneting.

82-001991 Scholes, P. THE EFFECT OF WIND DIRECTION ON TRAWL CATCHES; AN ANALYSIS OF HAUL-BY-HAUL DATA. *J. Cons. Cons. Int. Explor. Mer* 40(1):81-93. Feb. 1982. SFA 27(3)
[Fish. Lab., Lowestoft, Suffolk NR33 0HT, England]

82-001992 Strange, E. S. AN INTRODUCTION TO COMMERCIAL FISHING GEAR AND METHODS USED IN SCOTLAND. *Scott. Fish. Inf. Pamph.* No. 1 (revised). 35p. 1981. SFA 27(3)
[Mar. Lab., Aberdeen, Scotland]

82-001993 Williams, G. H.; D. A. McCaughran; S. H. Hoag and T. M. Koeneman. A COMPARISION OF PACIFIC HALIBUT AND TANNER CRAB CATCHES IN (1) SIDE-ENTRY AND TOP-ENTRY CRAB POTS AND (2) SIDE-ENTRY CRAB POTS WITH AND WITHOUT TANNER BOARDS. *Int. Pac. Halibut Comm. Tech. Rep.* No. 19. p. 15-35. 1982. SFA 27(3)
[Int. Pac. Halibut Comm., P.O. Box 5009, University Station, Seattle, WA 98105] Catch rates of Pacific halibut (*Hippoglossus stenolepis*) and Tanner crab (*Chionoecetes bairdi*) by several types of crab pot were compared. Top-entry crab pots had substantially lower catch rates of halibut than side-entry pots. Catch rates of legal Tanner crab in top-entry pots were only slightly lower than in side-entry pots, but the sample sizes were considered too small to clearly demonstrate this difference. "Tanner boards", which are placed horizontally across the upper half of the tunnel opening, reduced the catch rate of halibut by side-entry pots by 63%. In addition, the catch of halibut over 90cm long was almost eliminated. Tanner boards also reduced the catch rate of Tanner crab by side-entry pots, but overall crab catches were not large enough to provide meaningful results. Further research is recommended on crab pot modifications, and an observer program is

## FISHING GEAR AND TECHNIQUES (CONTINUED)

82-001993 CONTINUED recommended to establish halibut incidence rates in the commercial crab fisheries.

## FERTILIZATION OF SOIL AND WATER

82-001994 Hultberg, H. and I. B. Andersson. LIMING OF ACIDIFIED LAKES: INDUCED LONG-TERM CHANGES. *Water Air Soil Pollut*. 18(1-3):311-331. July, Aug., Sept. 1982. SFA 27(3)
[Swedish Water Air Pollut. Res. Inst., P.O. Box 5207, S-402 24, Gothenburg, Sweden]

## FISHWAYS, FISH PASSAGE THROUGH DAMS, ETC.

82-001995 Eicher, G. J. FISH PASSAGE IN NEW SOUTH WALES. *Fisheries (Bull. Am. Fish. Soc.)* 7(3):2-4. May-June 1982. SFA 27(3)

82-001996 Rhone, J. P. and A. B. Schlesinger. AN ANALYSIS OF FISH IMPINGEMENT RELATIVE TO THE MISSOURI RIVER ADULT FISH POPULATION IN THE VICINITY OF THE NEBRASKA CITY POWER STATION, UNIT NO. 1. *Proc. Nebr. Acad. Sci. Affil. Soc*. 92:16-17. 1982. Abstract only. 1982. SFA 27(3)
[Omaha Publ. Power Dist., Omaha, NE 68102]

## MATHEMATICS, STATISTICAL METHODS, AND MODELING

82-001997 Cushing, D. H. A SIMULACRUM OF THE ICELAND COD STOCK. *J. Cons. Cons. Int. Explor. Mer* 40(1):27-36. Feb. 1982. SFA 27(3)
[1981 Yarmouth Rd., Lowestoft, Suffolk NR32 4AB, England]

82-001998 DeAngelis, D. L. and C. C. Coutant. GENESIS OF BIMODAL SIZE DISTRIBUTIONS IN SPECIES COHORTS. *Trans. Am. Fish. Soc*. 111(3):384-388. May 1982. SFA 27(3)
[Environ. Sci. Div., Oak Ridge Natl. Lab., Oak Ridge, TN 37830]

82-001999 Jensen, A. L. ADJUSTING FISHERY CATCH CURVES FOR TRAWL SELECTION USING THE LOGISTIC DISTRIBUTION. *J. Cons. Cons. Int. Explor. Mer* 40(1):17-20. Feb. 1982. SFA 27(3)
[Sch. Nat. Resour., Univ. Mich., Ann Arbor 48109] The logistic distribution, a probability distribution in shape similar to the normal distribution, is applied to correct catch curves for trawl selection. The logistic probability density and distribution functions can be integrated in closed form, and this enables inclusion of a term for gear selection in the equation that describes population size as a function of age. The model is

## MATHEMATICS, STATISTICAL METHODS, AND MODELING (CONTINUED)

82-001999 CONTINUED applied to the North Sea plaice fishery and the results are compared with those of cohort analysis.

82-002000 Quinn, T. J. II; S. H. Hoag and G. M. Southward. COMPARISON OF TWO METHODS OF COMBINING CATCH-PER-UNIT-EFFORT DATA FROM GEOGRAPHIC REGIONS. *Can. J. Fish. Aquatic Sci.* 39(6):837-846. June 1982. In English with French summ. SFA 27(3)
[Int. Pac. Halibut Comm., P.O. Box 5009, University Station, Seattle, WA 98105]

82-002001 Shepherd, J. G. A VERSATILE NEW STOCK-RECRUITMENT RELATIONSHIP FOR FISHERIES, AND THE CONSTRUCTION OF SUSTAINABLE YIELD CURVES. *J. Cons. Cons. Int. Explor. Mer* 40(1):67-75. Feb. 1982. SFA 27(3)
[Fish. Lab., Lowestoft, Suffolk NR33 0HT, England]

82-002002 Silvert, W. OPTIMAL UTILIZATION OF A VARIABLE FISH SUPPLY. *Can. J. Fish. Aquatic Sci.* 39(3):462-468. Mar. 1982. In English with French summ. SFA 27(3)
[Bedford Inst. Oceanogr., P.O. Box 1006, Dartmouth, NS B2Y 4A2, Canada]

82-002003 Sims, S. E. THE EFFECT OF UNEVENLY DISTRIBUTED CATCHES ON STOCK-SIZE ESTIMATES USING VIRTUAL POPULATION ANALYSIS (COHORT ANALYSIS). *J. Cons. Cons. Int. Explor. Mer* 40(1):47-52. Feb. 1982. SFA 27(3)
[Dep. Math. Stat., La. Tech. Univ., Ruston 71272] The relative error in the value of the stock size calculated by Virtual Population Analysis (Cohort Analysis) that results from assuming that catches are evenly distributed throughout the year when, in fact, they are not is examined using both analytic methods and simulation. A measure of the intra-year distribution of catches called the balance is defined, and a relationship between the relative error in the calculated values of stock size, the balance, the natural mortality rate, and the rate of exploitation is derived.

82-002004 Thompson, K. W.; M. L. Deaton; R. V. Foutz; J. Cairns, Jr. and A. C. Hendricks. APPLICATION OF TIME-SERIES INTERVENTION ANALYSIS TO FISH VENTILATORY RESPONSE DATA. *Can. J. Fish. Aquatic Sci.* 39(3):518-521. Mar. 1982. In English with French summ. SFA 27(3)
[Dep. Biol., Univ. Miss., University 38677]

## LAKE MANAGEMENT AND RESEARCH

82-002005 Bennett, J. R. SOME EFFECTS OF MANIPULATING A NATURAL BROOK TROUT POPULATION IN A SUBALPINE LAKE. *Ph.D. dissertation, Univ. Wyo.* 137p. 1981. From Diss. Abstr. Int. B Sci. Eng. 42(10):3976. Apr. 1982. SFA 27(3)

82-002006 Bettoli, P. W. ANALYSIS OF COVE ROTENONE DATA COLLECTED IN LAKE CONROE, TEXAS. *Annu. Proc. Tex. Chap. Am. Fish. Soc.* 4:17. 1981[1982]. Abstract only. SFA 27(3)
[Dep. Wildl. Fish. Sci., Tex. A&M Univ., College Station]

## LAKE MANAGEMENT AND RESEARCH (CONTINUED)

82-002007 Ishak, M. M.; S. A. Abdel-Malek and M. M. Shafik. DEVELOPMENT OF MULLET FISHERIES (MUGILIDAE) IN LAKE QUARUN, EGYPT. *Aquaculture* 27(3):251-260. Apr. 1982. SFA 27(3)
[Inst. Oceanogr. Fish., Inland Waters Fish Cult. Div., 101 Ksr Al-Ainy St., Cairo, Egypt] The water of Lake Quarun have undergone severe chemical changes in the last 50 years. Salinity has increased progressively and is now 38°/oo in some regions of the lake. *Tilapia zillii* is the only species that has not been affected by the salinity increase. Mullet fry have been stocked in the lake since 1928. There has been a progressive increase in the average total production of mullet from 0.45 tons (1929-32) to 128.25 tons (1966-69), and to 291.67 tons (1975/76-1978/79). Length and age composition of mullets in Lake Quarun were studied. The growth in length and weight of *Mugil cephalus* showed that the fish were in better condition in Lake Quarun than in other coastal areas of Egypt. It is recommended that studies should continue to improve survival of transplanted mullet fry into the lake, and on the artificial propagation of mullets on site.

82-002008 Muller, R. G.; R. S. Benda and T. G. Powell. EXPLOITATION OF FISH IN THE INNER KAVIRONDO GULF OF LAKE VICTORIA BASED ON TAG RETURNS. *J. Fish Biol.* 20(6):667-671. June 1982. SFA 27(3)
[4015 Boulder Ave., Odessa, TX 79761]

82-002009 Selgeby, J. H. DECLINE OF LAKE HERRING (*COREGONUS ARTEDII*) IN LAKE SUPERIOR: AN ANALYSIS OF THE WISCONSIN HERRING FISHERY, 1936-78. *Can. J. Fish. Aquatic Sci.* 39(4):554-563. Apr. 1982. In English with French summ. SFA 27(3)
[U.S. FWS, Great Lakes Fish. Lab., Ashland Biol. Stn., Ashland, WI 54806]

82-002010 Swanson, B. L. ARTIFICIAL TURF AS A SUBSTRATE FOR INCUBATING LAKE TROUT EGGS ON REEFS IN LAKE SUPERIOR. *Prog. Fish-Cult.* 44(2):109-111. Apr. 1982. SFA 27(3)
[Wis. Dep. Nat. Resour., Bayfield 54814]

82-002011 Thorson, T. B. THE IMPACT OF COMMERCIAL EXPLOITATION ON SAWFISH AND SHARK POPULATIONS IN LAKE NICARAGUA. *Fisheries (Bull. Am. Fish. Soc.)* 7(2):2-10. Mar.-Apr. 1982. SFA 27(3)
[Sch. Life Sci., Univ. Nebr., Lincoln]

82-002012 Trautmann, N. M.; C. E. McCulloch and R. T. Oglesby. STATISTICAL DETERMINATION OF DATA REQUIREMENTS FOR ASSESSMENT OF LAKE RESTORATION PROGRAMS. *Can. J. Fish. Aquatic Sci.* 39(4):607-610. Apr. 1982. In English with French summ. SFA 27(3)
[Dep. Nat. Resour., Cornell Univ., Ithaca 14853]

## RIVER AND STREAM MANAGEMENT AND RESEARCH

82-002013 Gutierrez, W.; S. Delgado and J. Vera. INVESTIGATION SOBRE LOS POSIBLES EFECTOS DEL REPRESAMIENTO DEL RIO PUYANGO TUMBES EN LA HIDROBIOLOGIA Y PESQUERIAS DE LA REGION. [INVESTIGATION OF THE POSSIBLE EFFECTS OF IMPOUNDING THE PUYANGO-TUMBES RIVER ON THE HYDROBIOLOGY AND FISHERIES OF THE REGION.] *Inst. Mar. Peru (Callao) Inf.* No. 75. 39p. 1980. In Spanish with English summ. SFA 27(3)
[Invest. Pesq. Aguas Cont., Callao, Peru]

## RIVER AND STREAM MANAGEMENT AND RESEARCH (CONTINUED)

82-002013 CONTINUED

82-002014 Orth, D. J. and O. E. Maughan. EVALUATION OF THE INCREMENTAL METHODOLOGY FOR RECOMMENDING INSTREAM FLOWS FOR FISHES. *Trans. Am. Fish. Soc.* 111(4):413-445. July 1982. SFA 27(3)
[Dep. Fish. Wildl. Sci., VPI & SU, Blacksburg, VA 24061]

## FARM POND AND SMALL IMPOUNDMENT MANAGEMENT AND RESEARCH

82-002015 Farquhar, B. W. EVALUATION OF STRIPED BASS X WHITE BASS HYBRIDS IN SMALL IMPOUNDMENTS. *Annu. Proc. Tex. Chap. Am. Fish. Soc.* 4:55-66. 1981[1982]. SFA 27(3)
[Tex. Parks Wildl. Dep., 6200 Hatchery Rd., Fort Worth 76114] A study was conducted to evaluate the effects of striped bass (*Morone saxatilis*) x white bas (*M. chrysops*) hybrids on existing fish populations and sport fish harvest in small impoundments. Two lakes (40 and 42 ha) were initially stocked with 50 hybrids/ha (30 mm TL), followed by two years of supplemental stocking (25-50/ha). Growth rates of hybrids and selected centrarchids were monitored, and creel surveys conducted to determine effects of the hybrid introductions. Over the study period hybrids failed to reach sufficient size in adequate numbers in either lake to significantly impact existing fish populations or sport fishery. Hybrid growth was consistently lower in both lakes than those of hybrids found in larger reservoirs, and survival in one lake was apparently poor. The unsuccessful hybrid introduction could probably be attributed to competition with overabundant crappies (*Pomoxis* spp.) for available forage.

82-002016 Peters, E. J. A STUDY OF THE FISHES OF BUCKLEY CREEK RESERVOIR, JEFFERSON COUNTY, NEBRASKA. *Proc. Nebr. Acad. Sci. Affil. Soc.* 92:14. 1982. Abstract only. SFA 27(3)
[Dep. For. Fish. Wildl., Inst. Agric. Nat. Resour., Univ. Nebr., Lincoln 68583-0819]

## LARGE IMPOUNDMENT MANAGEMENT AND RESEARCH

82-002017 Murphy, B. R. GENETIC EVALUATION OF WALLEYE (*STIZOSTEDION VITREUM VITREUM*) STOCK STRUCTURE AND RECRUITMENT IN CLAYTOR LAKE, VIRGINIA. *Ph.D. dissertation, VPI&SU* 116p. 1981. From Diss. Abstr. Int. B Sci. Eng. 42(10):3893. Apr. 1982. SFA 27(3)
Multiple genetic stocks of walleyes can exist in a relatively small reservoir ecosystem, particularly in mainstream impoundments were very diverse habitats are often spatially isolated due to the large size of these reservoirs. The existence of these multiple stocks is an important consideration for effective management. Particular management strategies may not impact all genetic stocks in the reservoir equally (particularly if they are spatially isolated), and therefore may not produce the desired or expected results if the population is treated as being homogenous.

## ESTUARY MANAGEMENT AND RESEARCH

82-002018 Durand, J. R. and M. Skubich. **LES LAGUNES IVOIRIENNES. [THE LAGOONS OF THE IVORY COAST.]** *Aquaculture* 27(3):211-250. Apr. 1982. In French with English summ. SFA 27(3)
[Cent. Rech. Oceanogr., B. P. V18, Abidjan, Ivory Coast]

## MARINE MANAGEMENT AND RESEARCH

82-002019 Ajayi, T. O. **THE MAXIMUM SUSTAINABLE YIELDS OF THE INSHORE FISH AND SHRIMP RESOURCES OF THE NIGERIAN CONTINENTAL SHELF.** *J. Fish Biol.* 20(5):571-577. May 1982. SFA 27(3)
[Nigerian Inst. Oceanogr. Mar. Res., P.M.B. 12729, Victoria Island, Lagos, Nigeria] Schaefer's and exponential models are used to predict the maximum sustainable yields (MSY) of the Nigerian inshore fish and shrimp resources. The MSY values for fish caught down to 40 and 50 m were 11684.09 and 13742.35 metric tonnes (t), respectively. For shrimp, the MSY estimated was 2008.02 t. It appeared that the inshore fishery still had room for expansion, but the shrimp resources seemed to be fully exploited under the prevailing circumstances.

82-002020 Brill, R. W. **THE FUTURE OF BILLFISH RESEARCH: WHERE CAN WE GO FROM HERE?** *Proc. Annu. Conf. West. Assoc. Fish Wildl. Agencies* 61:52-57. 1981. SFA 27(3)

82-002021 **ENVIRONMENTAL SURVEY TECHNIQUES FOR COASTAL WATER ASSESSMENT CONFERENCE PROCEEDINGS.** *Proc. Environ. Surv. Techniques Coastal Water Assessment* v + 229p. Jan. 1980. SFA 27(3)
Available from Water Resour. Res. Cent., Univ. Hawaii, Manoa.

82-002022 FAO of the UN. **REPORT OF THE SECOND TECHNICAL CONSULTATION ON STOCK ASSESSMENT IN THE ADRIATIC.** *FAO Fish. Rep.* No. 253. ix + 186p. 1981. In French and English. SFA 27(3)
[Rome, Italy]

82-002023 FAO of the UN. **REPORT OF THE FIRST SESSION OF THE COMMITTEE FOR THE DEVELOPMENT AND MANAGEMENT OF FISHERIES IN THE SOUTHWEST INDIAN OCEAN.** *FAO Fish. Rep.* No. 254. vii + 58p. 1981. SFA 27(3)
[Rome, Italy]

82-002024 FAO of the UN. **REPORT OF THE SEVENTH SESSION OF THE FISHERY COMMITTEE FOR THE EASTERN CENTRAL ATLANTIC (CECAF).** *FAO Fish. Rep.* No. 255. xiii + 95p. 1981. SFA 27(3)
[Rome, Italy]

82-002025 FAO of the UN. **REPORT OF THE TECHNICAL CONSULTATION ON THE UTILIZATION OF SMALL PELAGIC SPECIES IN THE MEDITERRANEAN AREA.** *FAO Fish. Rep.* No. 252. viii + 159p. 1982. In English and French. SFA 27(3)
[Rome, Italy]

## MARINE MANAGEMENT AND RESEARCH (CONTINUED)

82-002026 Fithian, P. S. HAWAII SPORT FISHING. *Proc. Annu. Conf. West. Assoc. Fish Wildl. Agencies* 61:46-50. 1981. SFA 27(3)

82-002027 Fougner, S. DEVELOPMENT OF A FISHERY MANAGEMENT PLAN FOR BILLFISH IN THE WESTERN PACIFIC FISHERY CONSERVATION ZONE. *Proc. Annu. Conf. West. Assoc. Fish Wildl. Agencies* 61:51. 1981. Abstract only. SFA 27(3)

82-002028 Goeden, G. B. INTENSIVE FISHING AND A 'KEYSTONE' PREDATOR SPECIES: INGREDIENTS FROM COMMUNITY INSTABILTY. *Biol. Conserv.* 22(4):273-281. Apr. 1982. SFA 27(3)
[Queensl. Fish. Serv., North. Fish Res. Cent., Bungalow, Queensland 4870, Australia] A series of surveys of demersal fish stocks were carried out along the Great Barrier Reef in order to assess their condition and to investigate the effects of fishing on the large-predator community. Results from the surveys indicate that a significant relationship exists between the abundance of a 'keystone' predator species and the distance from major human population centres. Removal of this predator through fishing has the effect of bringing about changes in the relative abundance of other large predatory species including several that do not comprise part of the usual catch. Although the changes in community structure are apparently unpredictable, it is possible to calculate a measure of community flux which reflects the rate of this change relative to variations in the abundance of the keystone species.

82-002029 Griben, M. R.; W. A. Karp; C. M. Lynde and L. J. Bledsoe. PRESENT STATUS OF THE UNITED STATES HALIBUT FISHERY. *Proc. Annu. Conf. West. Assoc. Fish Wildl. Agencies* 61:28-45. 1981. SFA 27(3)
[Tetra Tech, Inc., 1900 116th Ave. N.E., Bellevue, WA 98004]

82-002030 Gulland, J. A. LONG-TERM POTENTIAL EFFECTS FROM MANAGEMENT OF THE FISH RESOURCES OF THE NORTH ATLANTIC. *J. Cons. Cons. Int. Explor. Mer* 40(1):8-16. Feb. 1982. SFA 27(3)
[Dep. Fish., FAO, Via delle Terme di Caracalla, I-00100 Rome, Italy] Long-term benefits from improved fishery management can be placed in four classes--greater gross value of the catch; reduced costs of capture; better allocation of benefits, e.g. between different regions, or different sections of the community; and reduced administrative and similar burdens. These benefits are discussed in general terms, and in relation to the value of the North Sea fisheries. Though the volume of the catch from the North Sea has more than doubled in the last 20 years, the value (at fixed prices) has probably not changed much. Different patterns of fishing might increase the value of the North Sea catch by 50% or more. The total net benefits from better management of the northeast Atlantic fisheries might be a billion ($10^9$) dollars annually.

82-002031 Hourston, A. S. FORECASTING BRITISH COLUMBIA HERRING STOCKS, 1973-1981. *Can. Tech. Rep. Fish. Aquatic Sci.* No. 1047. iv + 43p. Dec. 1982. In English with French summ. SFA 27(3)
[Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada]

82-002032 International Council for the Exploration of the Sea. REPORT OF THE DIALOGUE MEETING, 18 SEPTEMBER 1981. *Int. Counc. Explor. Sea Coop. Res. Rep.* No. 113. 33p. Feb. 1982. SFA 27(3)
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82-002033 Pepperell, J. C. USE OF TAGGING DATA TO STUDY SOME ASPECTS OF THE BIOLOGY OF BLACK MARLIN, *MAKAIRA INDICA*, ON THE EAST COAST OF AUSTRALIA. *Proc. Annu. Conf. West. Assoc. Fish Wildl. Agencies* 61:75-87. 1981. SFA 27(3)
[New South Wales State Fish., P.O. Box N211 Grosvenor St., Sidney 2000, Australia]

82-002034 Shomura, R. S. SUMMARY REPORT OF THE TECHNICAL PANEL DISCUSSION, TUNA BIOLOGY AND MANAGMENT. *Proc. Annu. Conf. West. Assoc. Fish Wildl. Agencies* 61:273-281. SFA 27(3)

82-002035 Wespestad, V. G.; S. H. Hoag and R. Narita. REDUCING THE INCIDENTAL CATCH OF PROHIBITED SPECIES IN THE BERING SEA GROUNDFISH FISHERY THROUGH GEAR RESTRICTIONS. *Int. Pac. Halibut Comm. Tech. Rep.* No. 19. p. 5-14. 1982. SFA 27(3)
[NMFS, 2725 Montlake Blvd. East, Seattle, WA 98112] The retention of several fully-utilized species (salmon, halibut, and crab) is prohibited in the Bering Sea groundfish fisheries. These prohibited species, however, are caught incidentally to groundfish, and the incidental catch reduces the yield available to the directed fisheries. The incidental catch of prohibited species is generally less with longlines or off-bottom trawls than with on-bottom trawls. Thus, one possible solution is to restrict the type of gear used in the groundfish fishery. This report examines the effect of restricting on-bottom trawls with respect to the production of groundfish as well as the catch of prohibited species. The results suggest that most of the available groundfish could be harvested with longlines and off-bottom trawls with a substantial reduction (over 80%) in the incidental catch of prohibited species. Allowing limited on-bottom trawling for flounders could minimize the loss of groundfish production and still provide for a reduction (over 60%) in the catch of prohibited species. Economic considerations were not examined, although the report recognizes that gear restrictions would likely increase the harvesting cost of some groundfish species.

82-002036 Witham, G. PERSPECTIVE ON MANAGEMENT OF OCEAN CHINOOK AND COHO SALMON FISHERIES WITHIN THE FISHERY CONSERVATION ZONE OFF CALIFORNIA, OREGON AND WASHINGTON. *Pac. Fish. Manage. Counc.* 28p. Mar. 1982. Available from Pac. Fish. Manage. Counc., 526 SW Mill St., Portland, OR 97201. SFA 27(3)

## UTILIZATION OF FISHERY PRODUCTS

82-002037 FAO of the UN. 1980 YEAR BOOK OF FISHERY STATISTICS, FISHERY COMMODITIES VOL. 51. *FAO Fish. Ser.* 17. ix + 178p. 1981. In English, French and Spanish. SFA 27(3)
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82-002038 Baugh, T. M. TECHNIQUE FOR PHOTOGRAPHING SMALL FISH. *Prog. Fish-Cult.* 44(2):99-101. Apr. 1982. SFA 27(3)
[1020 Custer Ave., Ogden, UT 84404]

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82-002039 Bouck, G. R. GASOMETER: AN INEXPENSIVE DEVICE FOR CONTINUOUS MONITORING OF DISSOLVED GASES AND SUPERSATURATION. *Trans. Am. Fish. Soc.* 111(4):505-516. July 1982. SFA 27(3)
[U.S. FWS, NMFS Res. Cent., Bldg. 204, Naval Support Activity, Seattle, WA 98115]

82-002040 Dunkley, D. A. and W. M. Shearer. AN ASSESSMENT OF THE PERFORMANCE OF A RESISTIVITY FISH COUNTER. *J. Fish Biol.* 20(6):717-737. June 1982. SFA 27(3)
[Freshwater Fish. Lab., 6 California St., Montrose, Angus DD10 8DW, Scotland] Closed-circuit television was used to provide a visual record of the events associated with the counts recorded by a resistivity fish counter. The fish seen were classified as 'large' fish ≥50 cm length and 'small' fish of <50 cm. Some of the 'large' fish escaped detection by the counter, some 'small' fish were counted and some counts were registered when nothing was seen. The sensitivity of the counter varied inversely with water conductivity which varied inversely with discharge. Evidence was obtained suggesting that fish ascending a weir tend to swim closer to the bottom than do those descending. It is found that fish tended to move upstream just after sunset and downstream just before sunrise except when the water was turbid and when the fish were very close to spawning. The numbers of fish movements recorded increased during those periods when discharge was decreasing after a spate but when spawning activity was at its peak, increased activity occurred in the complete absence of any change in discharge. Instances of the same fish re-crossing the counting zone several times were recorded and the simultaneous passage of more than one fish through the counting zone were observed.

82-002041 Everest, F. H. and J. Rodgers. TWO ECONOMICAL PHOTOPERIOD CONTROLS FOR LABORATORY STUDIES. *Prog. Fish-Cult.* 44(2):113-114. Apr. 1982. SFA 27(3)
[USDA For. Serv., For. Sci. Lab., 3200 Jefferson Way, Corvallis, OR 97331]

82-002042 McKim, J. M. and R. F. Syrett. MOBILE SURGICAL TABLE WITH AUTOMATIC SOLENOID SYSTEM FOR FISHERY APPLICATIONS. *Prog. Fish-Cult.* 44(2):75-78. Apr. 1982. SFA 27(3)
[U.S. EPA, 6201 Congdon Blvd., Duluth, MN 55804]

82-002043 Mulford, C. J. THE SURGICAL SKIN STAPLER AS A MEANS TO CLOSE INCISIONS IN FISH. *Annu. Proc. Tex. Chap. Am. Fish. Soc.* 4:3. 1981[1982]. Abstract only. SFA 27(3)
[Tex. Parks Wildl. Dep., Ft. Worth Res. Stn., Ft. Worth 76114] Sham ultrasonic transmitters were implanted in four adult striped bass to evaluate surgical procedures and the feasibility of using disposable surgical staplers as a means of closing incisions. After survery, these fish and one control were held in a 0.4-ha hatchery pond for approximately 1 month. The control and two implanted fish died within 10 days, most likely due to handling stress. However, when the pond was drained, two striped bass in good condition were retreived. The incisions had healed with no signs of infection. It appears the skin stapler is a suitable means for quick closure of incisions in fish if handling stress is minimal.

82-002044 Thomas, G. L.; R. E. Thorne and L. Johnson. A CASE HISTORY OF COMPLEMENTARY NET AND HYDROACOUSTIC SAMPLING TECHNIQUES IN THE SOUTHERN CALIFORNIA MULTI-SPECIES NEARSHORE OCEAN ENVIRONMENT. *Proc. Annu. Conf. West. Assoc. Fish Wildl. Agencies* 61:27. 1981. Abstract only. SFA 27(3)

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82-002046 FAO of the UN. WORLD LIST OF AQUATIC SCIENCES AND FISHERIES SERIAL TITLES. *FAO Fish. Tech. Pap.* No. 147(suppl. 5):x + 96p. 1981. SFA 27(3)
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82-002047 McHugh, J. L.; M. W. Sumner; P. J. Flagg; D. W. Lepton and W. J. Behrens. ANNOTATED BIBLIOGRAPHY OF THE HARD CLAM (*MERCENARIA MERCENARIA*). *NOAA Tech. Rep. NMFS SSRF* 756. iii + 845p. Mar. 1982. SFA 27(3)
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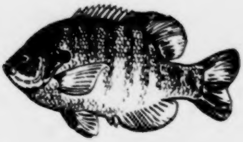


# AUTHOR INDEX

Abdel-Malek, S. A.
82-002007
Able, K. W.
82-001547
Addison, R. F.
82-001383
82-001888
Adelman, I. R.
82-001287
82-001648
Agius, C.
82-001792
82-001822
Ahne, W.
82-001823
82-001824
Ajayi, T. O.
82-002019
Akenhead, S.
82-001955
Akiyama, T.
82-001326
Aksiray, F.
82-001863
Al-Yamani, F. Y.
82-001840
Alderdice, D. F.
82-001981
Allen, J. R. M.
82-001673
Allendorf, F. W.
82-001540
Almendras, J. M. E.
82-001337
Alvarez-Pellitero, M. P.
82-001806
Alvarez-Pellitero, Ma. P.
82-001807
Amborski, R. L.
82-001804
Amelung, M.
82-001889
Amend, D. F.
82-001793
82-001794
82-001849
82-001890
Amthauer, R.
82-001490
Andersen, B. C.
82-001637
Andersson, I. B.
82-001994
Andreasen, J. K.
82-001891
Andrews, C.
82-001789
82-001808
82-001841
Angermeier, P. L.
82-001642
Anwar, A.
82-001310
Arai, K.
82-001421
Aravomo, G. A. O.
82-001674
Argyle, R. L.
82-001611
Armstrong, M. J.
82-001447
Armstrong, M. S.
82-001334
Arnason, A. N.
82-001973
Arrignon, J. C. V.
82-001278
Arthur, J. R.
82-001777
Ashton, C. E.
82-001643
Astakhov, D. A.
82-001377
Ayles, G. B.
82-001688
Babcock, W. H.
82-001953
Bailey, R. S.
82-001612
Baker, B. I.
82-001450
Baker, J. D.
82-001555
Baker, J. P.
82-001892
Bakkala, R. G.
82-001729
Balasch, J.
82-001939
Balon, E. K.
82-001623
Baltz, D. M.
82-001590
Bao, I. Y.
82-001384
Barnett, H.
82-001816
Bartell, S. M.
82-001644
Barton, M. G.
82-001645
Baruffaldi, A.
82-001475
Baugh, T. M.
82-001333
82-002038
Baylis, J. R.
82-001548

# AUTHOR INDEX

Beacham, T. D.
82-001624
Beamish, R. J.
82-001749
Bean, R. M.
82-001900
Beard, T. D.
82-001613
Beardmore, J. A.
82-001373
Beardsley, G. L.
82-001597
Becker, K.
82-001313
Behrens, W. J.
82-002047
Beitinger, T. L.
82-001428
82-001913
Bellan, G.
82-001893
Bemis, W. E.
82-001353
Benda, R. S.
82-002008
Bengert, G. A.
82-001940
Bennett, J. R.
82-002005
Bercy, C.
82-001979
Berg, B. A.
82-001329
Bergeron, T.
82-001354
Bergersen, E. P.
82-001954
Bergheim, A.
82-001864
Bergman, H. L.
82-001901
Bergman, P. K.
82-001944
Berkowitz, E. J.
82-001495
Bern, H. A.
82-001385
82-001412
82-001457
Berns, S.
82-001578
Berry, E. S.
82-001935
Bettoli, P. W.
82-002006
Beverley-Burton, M.
82-001858
Bialokoz, W.
82-001646

Biberman, L. J.
82-001442
Bigott, K.
82-001828
Billard, R.
82-001386
Bilton, H. T.
82-001976
82-001980
82-001981
Binkowski, F. P.
82-001461
Bishop, C. A.
82-001982
Bister, H.
82-001928
Blaber, S. J. M.
82-001702
82-001886
Bledsoe, L. J.
82-002029
Blumer, L. S.
82-001549
Blythe, R. H.
82-001871
Bobbitt, J.
82-001955
Boord, R. L.
82-001355
Booth, J. H.
82-001894
Booz, G. W.
82-001483
Borg, B.
82-001387
Borgese, J. M.
82-001388
Borgese, T. A.
82-001388
Borgmann, U.
82-001614
Bouck, G. R.
82-002039
Bowering, W. R.
82-001356
Boyd, C. E.
82-001289
82-001334
Bracken, B. E.
82-001635
Brader, J. D.
82-001389
Bradstreet, M. S. W.
82-001550
Brady, D. R.
82-001390
Braekken, O. R.
82-001451
Brammer, J. D.
82-001902

# AUTHOR INDEX

Branstetter, S.
82-001750
Brazier, O.
82-001551
Brenner, B. C.
82-001983
Breton, B.
82-001413
Brigham, W. U.
82-001966
Brighenti, L.
82-001475
Bright, G. R.
82-001703
Brill, R. W.
82-002020
Britton, R. H.
82-001647
Bronstein, P. M.
82-001625
Brooks, M. J.
82-001288
Brown, C. L.
82-001391
Brown, D. J. A.
82-001895
82-001896
Brown, L.
82-001636
Brown, S. W.
82-001289
Browne, D.
82-001528
Brummett, A. R.
82-001357
Bruno, D. W.
82-001790
Bry, C.
82-001290
Buchanan, T. M.
82-001704
Bucke, D.
82-001825
Buckley, J. T.
82-001897
82-001923
Burger, E. H.
82-001433
Burgess, J. W.
82-001898
Burggren, W.
82-001489
Burke, J. A.
82-001826
Burr, B. M.
82-001605
Bussing, W. A.
82-001751
Buth, D. G.
82-001523

...CONTINUED...
Buth, D. G.
82-001527
Butler, M. J. IV
82-001348
Butler, S. A.
82-001745
Bwathondi, P. O. J.
82-001304
Cabling, F., Jr.
82-001392
Cada, G. F.
82-001984
Cairns, J., Jr.
82-001469
82-002004
Cameron, D. G.
82-001528
Campbell, K. L. I.
82-001705
Canto, J. T., Jr.
82-001337
Carey, F. G.
82-001551
Carlander, K. D.
82-001675
Carmichael, G. J.
82-001899
Carpene, E.
82-001393
Carpenter, A. C.
82-001854
Carrillo, M.
82-001311
Carson, D. O.
82-001846
82-001847
Carter, A.
82-001704
Casey, J. G.
82-001551
Casterlin, M. E.
82-001486
Cerri, R. D.
82-001679
Chambolle, P.
82-001438
Chang, J. P.
82-001401
Changdong, G.
82-001842
Changlin, L.
82-001358
Chapman, D. G.
82-001986
Chappell, J. A.
82-001288
Chau, Y. K.
82-001940
Cheeseman, C. L.
82-001974

# AUTHOR INDEX

Chervinski, J.
82-001305
Cheung, P. F.
82-001809
Christensen, B. M.
82-001843
Christensen, N. O.
82-001778
Christiansen, B.
82-001394
Chua, T. E.
82-001306
Ciepielewski, W.
82-001615
Cincotta, D. A.
82-001865
Clady, M. D.
82-001653
Claiborne, J. B. III
82-001395
Clark, B.
82-001524
Clarke, L. A.
82-001552
Coates, D.
82-001626
Coche, A. G.
82-001279
82-002045
Cochran, P. A.
82-001648
Coke, M.
82-001706
Collette, B. B.
82-001752
Collins, B. W.
82-001676
Colt, J.
82-001335
Colwell, S. T.
82-001730
Compagno, L. J. V.
82-001374
Conover, D. O.
82-001741
Cook, C. N.
82-001968
Cook, R. C.
82-001359
Coombs, S.
82-001360
82-001553
Coons, L. B.
82-001811
Cooper, R. A.
82-001547
Coutant, C. C.
82-001998
Coyer, J. A.
82-001627
Crabtree, C. B.
82-001523
Crabtree, R. E.
82-001628
Craig, J. F.
82-001616
82-001985
Craig, P. C.
82-001591
Crapon de Caprona, M.-D.
82-001629
Crespo, S.
82-001939
Cushing, D. H.
82-001997
Cyrus, D. P.
82-001702
Czygan, F.-C.
82-001396
Dabrowksi, K. R.
82-001312
Dadzie, S.
82-001291
Dailey, M. D.
82-001844
Dalsgaard, I.
82-001845
Daly, J. G.
82-001803
Dangschat, H.
82-001813
Daoulas, C.
82-001687
Dashow, L.
82-001391
Dauble, D. D.
82-001900
Davie, P. S.
82-001397
Davies, D. S.
82-001307
Davies, R. W.
82-001880
Davis, B.
82-001525
Davis, K. B.
82-001511
Davis, P. S.
82-001707
82-001933
Dawe, M.
82-001914
Dawson, C. E.
82-001753
82-001754
Dawson, V. K.
82-001943
Daxboeck, C.
82-001397

# AUTHOR INDEX

...CONTINUED...
Damboeck, C.
82-001484
De Ruiter, A. J. H.
82-001398
De Wilde-Van Berge Henegouwen, M.
82-001515
Dean, J. M.
82-001701
DeAngelis, D. L.
82-001998
Deaton, M. L.
82-002004
Deelstra, H. A.
82-001399
DeGraeve, G. M.
82-001866
82-001901
Dehadrai, P. V.
82-001925
Delgado, S.
82-002013
Devi, A. P.
82-001926
deVlaming, V. L.
82-001420
Devlin, E. W.
82-001902
DeVries, A. L.
82-001470
82-001556
Dheer, T. R.
82-001456
Dia, A. K.
82-001292
Dickman, K. G.
82-001485
DiMichele, L.
82-001400
Dimmick, J. F.
82-001682
Divanach, P.
82-001319
82-001361
82-001570
Dixon, D. G.
82-001912
Dixon, K. R.
82-001880
Dixon, P. F.
82-001827
Do, T. T.
82-001851
Dobbe, F.
82-001513
Doi, M.
82-001336
Donaldson, E. M.
82-001285
82-001533
Dovel, W. L.
82-001690
Downer, P.
82-001554
Downhower, J. F.
82-001636
Drenner, R. W.
82-001657
Dronen, N. O., Jr.
82-001852
Du Buit, M. H.
82-001649
Dubin, R. E.
82-001555
DuBois, A. B.
82-001576
Dubois, M. P.
82-001438
Dubourg, P.
82-001438
DuBowy, V. S.
82-001708
Dudley, D. R.
82-001747
Dufford, D. W.
82-001966
Dumont, J. M.
82-001357
Dunham, R. A.
82-001288
82-001293
Dunkley, D. A.
82-002040
Dunn, J. L.
82-001707
Durand, J. R.
82-002018
Durocher, P. P.
82-001690
Duszynski, D. W.
82-001819
Dykova, I.
82-001815
Eagle, R. A.
82-001879
Eales, J. G.
82-001401
Eastcott, A.
82-001672
Eastman, J. T.
82-001402
82-001556
Eaton, R. C.
82-001557
Eckhardt, O.
82-001313
Eddy, B.
82-001921
Edgell, P. R.
82-001533

Edmonds, J. S.
82-001867
Eggers, D. M.
82-001986
Ehrlich, K. F.
82-001403
Eicher, G. J.
82-001995
Eiras, J. C.
82-001362
Eisler, R.
82-001903
El-Zeiny, M.
82-001310
Elder, R. G.
82-001901
Eliassen, J.-E.
82-001404
82-001405
Elliot, D. G.
82-001890
Ellis, A. E.
82-001498
82-001810
Ellory, J. C.
82-001470
Emmett, R. L.
82-001650
Endo, M.
82-001406
Engelhardt, T.
82-001294
Enzmann, P.-J.
82-001828
Epple, A. W.
82-001391
Evans, D. H.
82-001407
Everest, F. H.
82-002041
Ewing, M. S.
82-001904
Ewing, S. A.
82-001904
Ezenwa, B.
82-001314
Faas, L. F.
82-001910
Fahy, W. E.
82-001363
Fallon, W. E.
82-001900
Fange, R.
82-001372
82-001408
FAO of the UN
82-001526
82-001945
82-001946
...CONTINUED...
FAO of the UN
82-001967
82-002022
82-002023
82-002024
82-002025
82-002037
82-002046
Farquhar, B. W.
82-002015
Fausch, K. D.
82-001651
Fay, R. R.
82-001558
Fernald, R. D.
82-001364
Fernandes, B. M. M.
82-001853
Fernholm, B.
82-001755
Ferraris, C. J., Jr.
82-001677
Ferris, S. D.
82-001527
Fiandt, J. T.
82-001930
Figueroa, H. R.
82-001420
Fischthal, J. H.
82-001846
82-001847
82-001848
Fisher, J. E.
82-001678
Fisher, P. W.
82-001528
Fithian, P. S.
82-002026
Fitzgerald, N. E. C.
82-001811
Flagg, P. J.
82-002047
Flain, M.
82-001617
Flemming, B.
82-001906
Fletcher, J. M.
82-001985
Fluck, R. A.
82-001409
Flynn, J. K.
82-001793
82-001794
Follenius, E.
82-001410
Folmar, L. C.
82-001905
Fontaine, M.
82-001559

.ortner, N. A.
82-001411
Foskett, K. J.
82-001412
Fostier, A.
82-001413
Fougner, S.
82-002027
Fourmanoir, P.
82-001753
Foutz, R. V.
82-002004
Frank, K. T.
82-001592
Franke, E. D.
82-001812
Franklin, F. L.
82-001927
Franssen, J.
82-001756
Fraser, D. F.
82-001679
Fraser, J. M.
82-001351
Freeman, H. C.
82-001906
Freeze, T. M.
82-001389
Freshwater Biological Association
82-001950
Friday, A. E.
82-001487
Fridberg, G.
82-001780
From, J.
82-001829
Funston, C. W.
82-001447
Furuichi, M.
82-001414
Gabrielson, G.
82-001551
Galloway, J. E.
82-001871
Garcia Pinto, L.
82-001529
Gardner, G. A.
82-001344
Garman, G. C.
82-001652
Garofano, J. S.
82-001907
Garrell, M. H.
82-001283
Garrick, J. A. F.
82-001757
Garton, R. R.
82-001561
82-001868
Gascon, D.
82-001560
Gee, J. H.
82-001670
George, T. T.
82-001593
Georgi, T.
82-001415
Gerking, S. D.
82-001908
82-001947
Gerth, W. A.
82-001416
Ghittino, P.
82-001830
Giattina, J. D.
82-001561
82-001868
Giavenni, R.
82-001779
Gielen, J. T.
82-001417
Giles, M. A.
82-001909
Gilliland, E. R.
82-001653
Gladson, J.
82-001284
Gleason, L. N.
82-001843
Goeden, G. B.
82-002028
Goeden, H. M.
82-001924
Goetz, F. W.
82-001533
Goetz, R. C.
82-001389
Goicoechea, O.
82-001490
Gonzales-Lanza, M. C.
82-001806
Gonzales-Lanza, Ma. C.
82-001807
Goodman, E. D.
82-001871
Goodman, L. R.
82-001910
Goos, H. J. T.
82-001417
Gordin, H.
82-001339
Gordon, R.
82-001442
Gorman, O. T.
82-001747
Goshwami, S. V.
82-001446
Goto, A.
82-001598

Gould, R. W.
82-001791
Goven, B. A.
82-001869
82-001890
Gradall, K. S.
82-001562
Graham, T. E.
82-001806
Gray, R. H.
82-001900
Green, A. W.
82-001989
Green, L. M.
82-001709
Green, R. H.
82-001453
Greuel, E.
82-001328
Griben, M. R.
82-002029
Griesbach, S.
82-001869
Griffiths, W. B.
82-001591
Grillner, S.
82-001563
Grimes, C. B.
82-001547
Grindley, J. R.
82-001711
82-001712
82-001713
Groninger, H. S., Jr.
82-001816
Gropp, J.
82-001320
Grove, D. J.
82-001365
Gruber, D.
82-001469
Guerrero, R. D. III
82-001295
Guildal, J. A.
82-001850
Gulland, J. A.
82-002030
Guma'a, S. A.
82-001366
Gundersen, R. E.
82-001367
Gunther, K.-D.
82-001313
Guthrie, C. A.
82-001871
Gutierrez, W.
82-002013
Hagen, D. W.
82-001550
Hahnel, G. B.
82-001791
Haider, S.
82-001418
Hailman, J. P.
82-001564
Haldorson, L.
82-001591
Hall, N. E.
82-001891
Hall, T. R.
82-001419
82-001420
Halpern-Sebold, L.
82-001494
Halter, F.
82-001887
Hamada, S.
82-001459
Hampson, B. L.
82-001879
Hankin, D. G.
82-001975
Hansen, D. J.
82-001910
Hara, S.
82-001337
Hardiman, P. A.
82-001879
Harrington, E. S.
82-001956
Harrington, J.
82-001388
Harrington, R. W., Jr.
82-001956
Harris, G. P.
82-001343
Hartfiel, W.
82-001328
Hartman, G. F.
82-001637
Harvey, W. D.
82-001531
82-001532
Hasegawa, S.
82-001431
Hashimoto, A.
82-001421
Hashimoto, S.
82-001315
82-001316
82-001331
Hassanen, G. D. I.
82-001310
Havas, M.
82-001911
Haynes, C. N.
82-001710
Hazel, J. R.
82-001499

# AUTHOR INDEX

Heckmann, R. A.
82-001693
Heemstra, P. C.
82-001758
Heit, M.
82-001870
Hem, S.
82-001308
Hemmingsen, E. A.
82-001616
Hendricks, A. C.
82-002004
Hendrickson, D. A.
82-001718
Hendrix, G. A.
82-001871
Henry, S.
82-001704
Herrera, E.
82-001311
Herrick, C. J.
82-001871
Hesse, L.
82-001338
82-001584
Hetherington, T. E.
82-001353
Hetrick, F. M.
82-001818
Heydorn, A. E. F.
82-001711
82-001712
82-001713
Hibiya, T.
82-001473
82-001474
Hietanen, E.
82-001916
Hill, B. J.
82-001827
82-001831
Hill, L. G.
82-001460
Hille, S.
82-001422
Hilton, J.
82-001957
Hilton, J. W.
82-001912
Hirano, T.
82-001431
Hirasawa, Y.
82-001326
Hirshfield, H. I.
82-001907
Hjelmeland, K.
82-001423
Ho, J. S.
82-001851
Hoag, S. H.
82-001993
82-002000
82-002035
Hobbs, H. H. III
82-001348
Hocutt, C. H.
82-001865
Hodgins, H. O.
82-001905
Hodson, R. E.
82-001516
Hofer, R.
82-001424
Hoffman, C. J.
82-001565
Hoffman, G. L.
82-001814
Hoffmann, R.
82-001813
Hogue, E. W.
82-001654
Holcombe, G. W.
82-001930
Holeton, G. F.
82-001425
82-001894
Holmbom, B.
82-001928
Holmgren, S.
82-001408
Holopainen, I. J.
82-001622
Holstein, B.
82-001426
Holubetz, T.
82-001948
Hoornbeek, F. K.
82-001309
Horlyck, V.
82-001829
Horne, M. T.
82-001792
Horner, R.
82-001352
Hoshino, Y.
82-001336
Houde, E. D.
82-001714
Hourston, A. S.
82-001601
82-002031
House, E. W.
82-001493
Houston, A. H.
82-001427
Hu, L. C.
82-001680
Hubbard, G. M.
82-001412

Hubert, W. A.
  82-001695
  82-001987
Huey, D. W.
  82-001428
  82-001913
Hughes, G. W.
  82-001720
Hughes, S. G.
  82-001342
Hultberg, H.
  82-001994
Hunt, R. L.
  82-001958
Hunter, G. A.
  82-001533
Hutchinson, T. C.
  82-001911
Ikeda, S.
  82-001492
Ince, B. W.
  82-001321
Ingermann, R. L.
  82-001429
Ingham, R. E.
  82-001852
International Council for the Exploration of the Sea
  82-001872
  82-002032
Irvine, J. R.
  82-001655
Ishak, M. M.
  82-001310
  82-002007
Ishii, K.
  82-001546
Ishioka, H.
  82-001430
Itazawa, Y.
  82-001332
Ivanowicz, H. R.
  82-001832
Iwata, M.
  82-001431
Jalabert, B.
  82-001413
Jansen, W. F.
  82-001433
Janssen, J.
  82-001664
Jansz, G. F.
  82-001894
Jayasri, M.
  82-001814
Jeanjean, S.
  82-001559
Jenkinson, D. W.
  82-001976
Jensen, A. L.
  82-001873
  82-001999
Jermolajev, E.
  82-001351
Jimenez, D.
  82-001832
Jiwei, S.
  82-001842
Jobling, M.
  82-001317
  82-001434
  82-001700
  82-001748
Johansen, K.
  82-001394
  82-001479
Johansson, N.
  82-001780
Johnson, J. H.
  82-001661
Johnson, K. A.
  82-001793
  82-001794
  82-001796
Johnson, L.
  82-002044
Johnson, R. H.
  82-001822
Jones, D. R.
  82-001435
  82-001501
Jones, K. A.
  82-001566
Jones, R. T.
  82-001436
Jonsson, A.-C.
  82-001432
Joswiak, G. R.
  82-001534
Joysey, K. A.
  82-001487
Julshamn, K.
  82-001451
June, J. A.
  82-001703
Kagawa, H.
  82-001437
  82-001521
Kah, O.
  82-001438
Kain, D. G.
  82-001681
Kaiser, K. L. E.
  82-001874
Kallman, K. D.
  82-001384
Kanazawa, A.
  82-001318

# AUTHOR INDEX

Kanwisher, J. W.
82-001551
Karmali, K.
82-001442
Karp, W. A.
82-002029
Karr, J. R.
82-001747
Kashiwagi, E.
82-001539
Kato, M.
82-001640
Kato, S.
82-001467
Kaushik, S. J.
82-001323
Kavaliers, M.
82-001439
82-001567
82-001568
Kawasaki, T.
82-001742
Kearns, P. K.
82-001875
Kellogg, R. L.
82-001440
Kennedy, G. J. A.
82-001569
Kent, C.
82-001345
Kentouri, M.
82-001319
82-001361
82-001570
Kerr, S. R.
82-001441
Kesbeke, F.
82-001513
82-001514
Khan, R. A.
82-001914
Kiceniuk, J. W.
82-001914
Kiessling, A.
82-001476
Kimura, M.
82-001406
King, G. M.
82-001442
Kirsch, R.
82-001443
Kissil, G. W.
82-001329
Klaverkamp, J. F.
82-001909
Kleinholz, C. W.
82-001653
Kleinzeller, A.
82-001483
Klusek, C. S.
82-001870
Kobayashi, A.
82-001421
Kodama, M.
82-001915
Koeneman, T. M.
82-001993
Koester, D. M.
82-001368
Kohler, N. E.
82-001668
Kohn, A.
82-001853
Kondo, T.
82-001492
Koops, H.
82-001320
82-001330
Korsgaard, B.
82-001444
Koslow, J. A.
82-001971
Kose, T. F.
82-001427
Kott, E.
82-001773
Koury, B.
82-001816
Kozel, T. R.
82-001781
Kramar, O.
82-001940
Kramer, D. L.
82-001632
Kramer, J. M.
82-001881
Krant, J.
82-001339
Krasey, C. R.
82-001973
Krasnoperova, S. V.
82-001535
Krauskopf, M.
82-001490
Krieger, K. J.
82-001977
Kruger, A.
82-001396
Krupp, F.
82-001759
Krzywosz, T.
82-001646
Kudo, G.
82-001816
Kuhns, J. F.
82-001782
Kulikova, N. I.
82-001445

## AUTHOR INDEX

Kullander, S. O.
82-001760
Kux, Z.
82-001369
Kyle, R.
82-001715
LaBounty, J. F.
82-001959
Lacey, S. M.
82-001854
Lagasse, P.
82-001965
Laitinen, M.
82-001916
Lamba, V. J.
82-001446
Laming, P. R.
82-001447
Lane, E. B.
82-001571
Larkin, J. R.
82-001357
Larsen, J. L.
82-001795
82-001797
Lauder, G. V.
82-001360
Lauf, P. K.
82-001448
Lavender, W. A.
82-001557
Le Bras, Y. M.
82-001449
Le Martret, M.-A.
82-001572
Leatherland, J. F.
82-001450
82-001917
Lederman, T. C.
82-001876
82-001877
Lee, R. M.
82-001908
Leggett, W. C.
82-001592
Lemly, A. D.
82-001682
Lenarz, W. H.
82-001638
Lenat, D. R.
82-001682
Lesniak, J. A.
82-001918
LeValley, M. J.
82-001919
Li, R. M.
82-001965
Libosvarsky, J.
82-001369
Licata, A.
82-001522
Lied, E.
82-001451
Liem, K. F.
82-001360
Lieska, N.
82-001487
Liley, N. R.
82-001463
Limsuwan, C.
82-001920
Limsuwan, T.
82-001322
Lindquist, D. G.
82-001728
Lingling, W.
82-001370
Link, G. W., Jr.
82-001726
Lipton, D. W.
82-002047
Loar, J. M.
82-001984
Lock, J. T.
82-001296
Loenn, B.-E.
82-001452
Loftus, D. H.
82-001618
Loginova, G. A.
82-001535
Lom, J.
82-001815
Lomholt, J. P.
82-001394
Lone, K. P.
82-001321
Lotrich, V. A.
82-001519
Lovegrove, S. M.
82-001921
Lovell, R. T.
82-001322
Lucas, J. R.
82-001656
Luquet, P.
82-001323
Lynde, C. M.
82-002029
Lyons, B. W.
82-001536
MacDonald, C. D.
82-001630
MacDonald, J. S.
82-001453
Macey, D. J.
82-001454
82-001455

# AUTHOR INDEX

Machen, T. E.
82-001412
Mackie, A. N.
82-001329
Mackiewicz, J. S.
82-001812
MacPherson, K. A.
82-001726
Mahajan, C. L.
82-001456
Mahnken, C. V. W.
82-001385
Maier, B.
82-001828
Main, J.
82-001988
Mainoya, J. R.
82-001457
82-001458
Maiolie, M.
82-001954
Majnarich, J. J.
82-001800
Malins, D. C.
82-001922
Mangel, M.
82-001833
Mangunwiryo, H.
82-001822
Manning, C. S.
82-001910
Manning, M. J.
82-001498
Manooch, C. S. III
82-001685
Manthey, M.
82-001330
Marcuzzi, O.
82-001413
Margolis-Kazan, H.
82-001494
Margolis, L.
82-001777
Markiw, M. E.
82-001820
Marshall, B. E.
82-001743
Marshall, S. L.
82-001371
82-001619
Martin, H. C.
82-001878
Martinez, G. J.
82-001594
Martini, F. H.
82-001573
Masada, M.
82-001468
Mascarello, F.
82-001393
Matheson, A. T.
82-001897
82-001923
Mathis, P.
82-001524
Mathur, D.
82-001349
Matlock, G. C.
82-001989
Matsui, T.
82-001459
Matsumiya, Y.
82-001631
Matsushita, K.
82-001639
Matthews, W. J.
82-001460
82-001716
Mattisson, A.
82-001372
Matty, A. J.
82-001321
Maughan, O. E.
82-002014
Mayama, H.
82-001640
Mayberry, R. D.
82-001683
McAfee, N. E.
82-001978
McAndrew, B. J.
82-001373
McCarter, J. A.
82-001897
82-001923
McCarthy, D. H.
82-001796
McCaughran, D. A.
82-001993
McCauley, R. W.
82-001461
McComas, S. R.
82-001657
McCosker, J. E.
82-001761
82-001766
McCulloch, C. E.
82-002012
McDerment, S.
82-001792
McDonald, D. G.
82-001462
McDonald, L. L.
82-001745
McDonald, T. E.
82-001777
McDonough, T. A.
82-001730
McEachran, J. D.
82-001374

# AUTHOR INDEX

McElderry, H.
82-001591
McGlade, J. M.
82-001537
McGregor, A. J.
82-001619
McHugh, J. L.
82-002047
McKee, P. M.
82-001595
McKenna, M. G.
82-001717
McKim, J. M.
82-001924
82-002042
McMillan, C. B.
82-001762
McVicar, A. H.
82-001810
82-001821
Medgyesy, N.
82-001324
Meffe, G. K.
82-001718
Meier, W.
82-001834
Mein, C. G.
82-001398
Meister, M. F.
82-001443
Mellergaard, S.
82-001795
82-001797
Merrill, C.
82-001885
Meske, C.
82-001313
Meyer, J. H.
82-001463
82-001574
Middaugh, D. P.
82-001628
Mikel, H. C.
82-001972
Milhous, R. T.
82-001965
Miller, D. S.
82-001485
Miller, R. A.
82-001560
Miller, S. J.
82-001684
Miller, W. R. III
82-001464
Millikin, M. R.
82-001325
Mills, C. A.
82-001744
Mills, K. H.
82-001973
Minami, T.
82-001596
Mishra, A. P.
82-001379
Misra, M.
82-001477
Misra, R. K.
82-001356
Mitani, I.
82-001855
Mitani, T.
82-001631
Mitchell, A. J.
82-001783
Mitson, R. B.
82-001974
Momzikoff, A.
82-001559
Moodie, G. E. E.
82-001530
Moore, R. L.
82-001880
Moore, W. S.
82-001534
Moores, J. A.
82-001658
Morgan, R. P. II
82-001465
Moring, J. R.
82-001960
Morris, S. L.
82-001375
Morrow, I. H.
82-001740
Moser, M. E.
82-001647
Motzkin, F.
82-001339
Moyer, J. T.
82-001538
Moyle, P. B.
82-001590
Mpoame, M.
82-001784
Muir, W. D.
82-001650
Mukherji, A. P.
82-001925
Mukhopadhyay, P. K.
82-001925
Mulford, C. J.
82-002043
Mulian, R.
82-001719
Muller, R. G.
82-002008
Munn, C. B.
82-001798
Munro, A. L. S.
82-001790

...CONTINUED...
Munro, A. L. S.
82-001810
Murai, T.
82-001326
Murdy, E. O.
82-001677
Muroga, K.
82-001799
Murphy, B. R.
82-002017
Murty, A. S.
82-001926
Muszynski, G.
82-001403
Muth, R. T.
82-001710
Muzzall, P. M.
82-001785
82-001786
Mwenesi, R.
82-001502
Nagahama, Y.
82-001437
82-001521
Nagel, J. W.
82-001599
Nagel, R. L.
82-001388
Nahhas, F. M.
82-001840
Nakai, T.
82-001799
Nakamura, Y.
82-001466
Nakari, T.
82-001502
Nakatsuru, K.
82-001632
Narahara, A. M.
82-001698
Narita, R.
82-002035
Neff, J. M.
82-001934
Negishi, K.
82-001467
Negishi, S.
82-001468
Neill, W. H.
82-001532
Nelson, J. S.
82-001763
Nelson, R. S.
82-001685
Nesler, T. P.
82-001350
82-001961
Newman, S. G.
82-001800
Nibaruta, G.
82-001756
Nielsen, L. A.
82-001652
Nieminen, M.
82-001916
Nieuwenhuys, R.
82-001360
Nigrelli, R. F.
82-001809
Nikinmaa, M.
82-001512
Niles, S.
82-001327
Niwa, M.
82-001942
Noble, R. L.
82-001531
82-001532
82-001983
Nomura, T.
82-001801
Northcote, T. G.
82-001655
Northcutt, R. G.
82-001355
Norton, M. G.
82-001879
82-001927
Nose, T.
82-001326
Nose, Y.
82-001639
Nunn, G.
82-001469
Nunny, R. S.
82-001879
O'Brien, W. J.
82-001666
O'Grady, S. M.
82-001470
Obika, M.
82-001468
Oduleye, S. O.
82-001686
Ogasawara, Y.
82-001336
Ogata, H.
82-001326
Ogata, T.
82-001915
Ogawa, M.
82-001471
Ogilvie, D. M.
82-001575
Ogilvy, C. S.
82-001576
Oglesby, R. T.
82-002012

# AUTHOR INDEX

Ohoka, T.
82-001468
Ohta, H.
82-001376
Oikari, A.
82-001452
82-001928
Ojima, Y.
82-001539
Olafson, R. W.
82-001923
Olcese, J. M.
82-001420
Olito, C.
82-001525
Oliver, J. D.
82-001472
Omeljaniuk, R. J.
82-001401
Orth, D. J.
82-002014
Osborn, M. F.
82-001951
Osborne, L. L.
82-001880
Oshiro, T.
82-001473
82-001474
Ottolenghi, C.
82-001475
Pacific Marine Fisheries Commission
82-001952
Palko, B. J.
82-001597
Paloheimo, J. E.
82-001745
Pandey, K.
82-001477
82-001929
Papaconstantinou, C.
82-001687
Papst, M. H.
82-001688
Parin, N. V.
82-001377
82-001764
Paris, J.
82-001319
82-001361
Parker, B. J.
82-001595
Parker, N. C.
82-001340
Parker, S. S.
82-001371
Parmley, D.
82-001266
Part, P.
82-001476
Passino, D. R. M.
82-001881
Patashnik, N.
82-001816
Patch, J. R.
82-001518
Paterson, W. B.
82-001817
Pati, S.
82-001990
Patterson, C.
82-001360
Pavlov, D. S.
82-001577
Pawson, M. G.
82-001425
Payne, G.
82-001347
Pearre, S., Jr.
82-001659
Peden, A. E.
82-001720
Pelczarski, J. E.
82-001832
Penrose, D. L.
82-001882
Pepperell, J. C.
82-002033
Pereira-Bueno, J. M.
82-001806
Pereira-Bueno, J. Ma.
82-001807
Persson, L.
82-001478
Pesonen, S.
82-001502
Peterman, R. M.
82-001689
Peters, E. J.
82-001678
82-002016
Peters, H. M.
82-001578
Peters, J. C.
82-001962
Peters, R. H.
82-001869
Pettersson, K.
82-001479
Pettit, R. D.
82-001650
Peute, J.
82-001417
Pevtsova, E. I.
82-001480
Phelps, S. R.
82-001540
Phillips, G. L.
82-001721

...CONTINUED...
Phillips, G. L.
82-001957
Phillips, P. C.
82-001722
Phipps, G. L.
82-001930
Pick, F. R.
82-001347
Pickford, G. E.
82-001411
Pickmere, S.
82-001347
Pienaar, U. de V.
82-001723
Pincock, D. G.
82-001518
Policansky, D.
82-001461
Pond, V.
82-001941
Popma, T. J.
82-001482
Popper, A. N.
82-001360
82-001553
Portanova, R.
82-001402
Post, A.
82-001724
Poston, T. M.
82-001883
Potter, I. C.
82-001454
82-001455
Powell, T. G.
82-002008
Power, M. E.
82-001660
Powers, D. A.
82-001400
Pratt, H. L., Jr.
82-001551
Prentice, J. A.
82-001690
Prepas, E. E.
82-001346
Pritchard, J. B.
82-001483
Purdy, E. J., Jr.
82-001349
Puviani, A. C.
82-001475
Puyear, R. L.
82-001902
Qianru, C.
82-001370
Quinn, T. J. II
82-002000
Quinn, T. P.
82-001579
Raa, J.
82-001423
Rabelahatra, A.
82-001297
Radtke, R.
82-001701
Radtke, R. L.
82-001691
Ralston, S. V. D.
82-001620
Randall, D. J.
82-001484
Randall, J. E.
82-001761
82-001765
82-001766
82-001767
Rasin, V. J., Jr.
82-001465
Reiling, S. D.
82-001968
Reilly, C. A.
82-001725
Reimchen, T. E.
82-001856
Rendell, C. A.
82-001897
Renfro, J. L.
82-001485
Renou, P.
82-001323
Reynolds, W. W.
82-001486
Rhee, G-Y.
82-001876
82-001877
Rhone, J. P.
82-001996
Richards, W. J.
82-001597
Rickard, N. A.
82-001986
Riddle, L. M.
82-001804
Rigler, F. H.
82-001346
Ring, O.
82-001476
Ringler, N. H.
82-001661
Rinne, J. N.
82-001718
Rivera, E. R.
82-001367
Robb, A. P.
82-001378
Roberts, D.
82-001447
Roberts, L. B.
82-001365

# AUTHOR INDEX

Roberts, T. R.
82-001768
82-001769
Robertson, A. I.
82-001692
Robison, H. W.
82-001716
Roch, M.
82-001897
82-001923
Rodgers, J.
82-002041
Rogers, S. C.
82-001518
Rolfe, M. S.
82-001879
Romero-Herrera, A. E.
82-001487
Rosen, D. E.
82-001360
Ross, J. L.
82-001662
Ross, S. W.
82-001726
Rothbard, S.
82-001298
Rowell, D. M.
82-001488
Roys, R. S.
82-001280
Ruby, S. M.
82-001918
Ruggieri, G. D.
82-001809
Rumsey, G. L.
82-001342
Ryman, N.
82-001543
Sacca, R.
82-001489
Saez, L.
82-001490
Saglio, P.
82-001572
Sakai, D. K.
82-001491
Sakai, M.
82-001598
Sakamoto, M.
82-001318
Sakanari, J.
82-001725
Samonina, G. E.
82-001480
Samples, K. C.
82-001969
Sandifer, P. A.
82-001737
Sangalang, G.
82-001906
Sangster, G. I.
82-001988
Sargent, R. C.
82-001633
Sarig, S.
82-001281
Sartoris, J. J.
82-001959
Sasaki, K.
82-001931
Sato, H.
82-001459
Sato, M.
82-001492
Savino, J. F.
82-001663
Savitz, J.
82-001664
82-001665
Sawyer, E. S.
82-001309
Sawyer, P. J.
82-001309
Schaefer, W. F.
82-001693
Schiavone, A., Jr.
82-001694
Schlesinger, A. B.
82-001996
Schmid, W. D.
82-001721
Schmidt, D.
82-001666
Schmidt, S. P.
82-001493
Schmitt, D. N.
82-001695
82-001987
Schnute, J. T.
82-001981
Schofield, C. L.
82-001892
Scholes, P.
82-001991
Schrader, G. C.
82-001352
Schreck, C. B.
82-001285
82-001504
82-001505
Schreibman, M. P.
82-001494
82-001495
Schulz, D.
82-001328
Schutsky, R. M.
82-001349
Schwalb-Buhling, A.
82-001320

Schwantes, A. R.
82-001496
82-001497
Schwantes, M. L. B.
82-001496
82-001497
Schwille, E. M.
82-001963
Scott, A. L.
82-001802
Scrivener, J. C.
82-001637
Seabloom, R. W.
82-001717
Seagle, H. H., Jr.
82-001599
Secombes, C. J.
82-001498
Seeb, J.
82-001541
Seehorn, M. E.
82-001964
Seikai, T.
82-001932
Sekarak, A. D.
82-001600
Seki, J.
82-001640
Selgeby, J. H.
82-002009
Sellner, P. A.
82-001499
Selmer-Olsen, A. R.
82-001864
Serns, S. L.
82-001746
Setlow, R. B.
82-001941
Shafik, M. M.
82-002007
Sharma, D. C.
82-001933
Sharma, P. K.
82-001933
Sharp, J. R.
82-001934
Shea, T. B.
82-001935
Shealy, M. H., Jr.
82-001737
Shearer, W. M.
82-002040
Sheel, M.
82-001379
Shelton, G.
82-001425
Shelton, W. L.
82-001542
Shepherd, J. G.
82-002001
Shimizu, C.
82-001459
82-001509
82-001510
Shimizu, I.
82-001640
82-001801
Shimizu, M.
82-001639
Shirley, K.
82-001704
Shomura, R. S.
82-002034
Shrestha, J.
82-001727
Shtaf, L. G.
82-001577
Shukla, J. P.
82-001929
Shute, J. R.
82-001728
Shute, P. W.
82-001728
Shuttleworth, T. J.
82-001937
Sibbing, F. A.
82-001667
Siebenaller, J. F.
82-001500
Silvalingam, P. M.
82-001936
Silvert, W.
82-002002
Simco, B. A.
82-001511
82-001811
82-001899
Simons, D. B.
82-001965
Sims, S. E.
82-002003
Singh, B. R.
82-001379
Singh, I.
82-001379
Singh, I. J.
82-001418
Singh, S. M.
82-001936
Sivak, J. G.
82-001580
Sivertsen, A.
82-001864
Skubich, M.
82-002018
Smail, D. A.
82-001822
Smith, D. C.
82-001696

## AUTHOR INDEX

Smith, F. M.
82-001501
Smith, G. B.
82-001729
Smith, G. F.
82-001352
Smith, J. E.
82-001472
Smith, M. M.
82-001765
Smith, R. J. F.
82-001581
Smith, R. L.
82-001871
Smitherman, R. O.
82-001288
82-001299
Snelson, F. F., Jr.
82-001697
Soderberg, R. W.
82-001341
Soivio, A.
82-001502
82-001512
Sokabe, H.
82-001471
Somero, G. N.
82-001500
Sommerville, C.
82-001835
82-001836
Sonski, A. J.
82-001503
Sonstegard, R. A.
82-001917
Sosiak, A. J.
82-001582
Souchon, Y.
82-001290
Southward, G. M.
82-002000
Sower, S. A.
82-001285
82-001504
82-001505
Spieler, R. E.
82-001486
Spigarelli, S. A.
82-001873
Stacey, N. E.
82-001601
Stadler, H.
82-001436
Stagg, R. M.
82-001937
Stahl, G.
82-001563
Starnes, L. B.
82-001730
Stasiak, R. H.
82-001534
82-001602
States, J. B.
82-001900
Stauffer, J. R., Jr.
82-001865
Stauffer, T. M.
82-001735
Stein, R. A.
82-001663
Steinhaus, V. S.
82-001731
82-001732
82-001733
82-001734
Stetson, M. H.
82-001391
Stevens, D. G.
82-001868
Stevens, E. D.
82-001506
Stevenson, R. M. W.
82-001803
Stickney, R. R.
82-001303
Stillwell, C. E.
82-001668
Stirn, J.
82-001884
Stone, W. B.
82-001698
Storck, T.
82-001684
Storck, T. W.
82-001966
Stout, R. B.
82-001787
Strait, L. E.
82-001283
Strange, C. D.
82-001569
Strange, E. S.
82-001992
Strauss, R. E.
82-001669
Strawn, K.
82-001300
Stribley, J. A.
82-001602
Stucky, R. K.
82-001770
Sumantadinata, K.
82-001544
82-001545
Sumner, M. W.
82-002047
Sundararaj, B. I.
82-001446

## AUTHOR INDEX

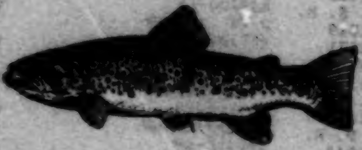
Suo, L.
82-001857
Surat, E.
82-001460
Suriano, D. M.
82-001858
Suzuki, A.
82-001545
Suzuki, T.
82-001931
Svensson, K. M.
82-001780
Swain, A.
82-001634
Swanson, B. L.
82-002010
Swenson, W. A.
82-001562
82-001693
Syrett, R. F.
82-002042
Tabata, M.
82-001507
82-001508
Takama, K.
82-001392
Takeda, H.
82-001509
82-001510
Takeda, M.
82-001931
Takeda, T.
82-001332
Taki, Y.
82-001336
Tallman, R. F.
82-001670
Tamoto, Y.
82-001587
Tanaka, M.
82-001631
Tandler, A.
82-001329
Taniguchi, N.
82-001544
82-001545
Tatner, M.
82-001792
Taubert, B. D.
82-001699
Tave, D.
82-001299
Taylor, J. L.
82-001968
Teng, S. K.
82-001306
Teranishi, T.
82-001376
82-001467
Teravainen, T.
82-001502
Terry, J. M.
82-001970
Terwilliger, R. C.
82-001429
Teshima, S.
82-001318
Teugels, G. G.
82-001771
Thatcher, V. E.
82-001859
Thomas, G. L.
82-001583
82-002044
Thomas, J. T.
82-001887
Thommes, M. M.
82-001873
Thompson, K. W.
82-002004
Thorne, R. E.
82-001641
82-002044
Thorson, T. B.
82-001603
82-002011
Threlfall, W.
82-001788
82-001860
Thune, R. L.
82-001804
Tiews, K.
82-001320
82-001330
Todd, P. R.
82-001680
Toffoli, E. V.
82-001282
Tomasso, J. R.
82-001511
82-001899
Tomioka, K.
82-001801
Topping, G.
82-001938
Toranzo, A. E.
82-001818
Tort, L.
82-001939
Toth, L. A.
82-001747
Tranquilli, J. A.
82-001699
Trautmann, N. M.
82-002012
Trust, T. J.
82-001798
Tsimenidis, N.
82-001687

Tung, I.-H.
82-001664
Turner, D. A.
82-001738
Tuurala, H.
82-001512
Uchihashi, K.
82-001380
82-001381
Uchiyama, M.
82-001931
Uin, L.
82-001401
Underhill, J. C.
82-001721
Upton, S. J.
82-001819
Uraiwan, S.
82-001688
Urdaneta, H. E.
82-001805
Uruena, G.
82-001419
Urmann, J. B.
82-001567
Vahl, O.
82-001404
82-001405
Valter, G. A.
82-001645
Van Cauwenberghe, K.
82-001399
Van Den Bosch, R. A.
82-001417
Van den Hurk, R.
82-001495
Van den Thillart, G.
82-001513
Van Der Kraak, G.
82-001401
Van Oordt, P. G. W. J.
82-001417
Van Waarde, A.
82-001513
82-001514
82-001515
Van Winkle, W.
82-001621
Vancil, R.
82-001338
82-001584
Vari, R. P.
82-001772
Vasil'eva, E. D.
82-001382
Vaughan, D. S.
82-001621
Vaught, R. S.
82-001846
...CONTINUED...
Vaught, R. S.
82-001847
Vegetti, A.
82-001393
Vera, J.
82-002013
Verheye, H. M.
82-002048
Vestergard Jorgensen, P. E.
82-001837
82-001838
82-001839
Vetter, R. D.
82-001516
Vetter, R. J.
82-001875
Videler, J. J.
82-001585
Viljanen, M.
82-001622
Vincke, P.
82-002049
Vladykov, V. D.
82-001773
Vogelbein, W.
82-001844
Vollenweider, R. A.
82-001343
Vyse, E. R.
82-001528
Wagner, W. C.
82-001735
Waiwood, K. G.
82-001453
Wakabayashi, H.
82-001799
Wakamatsu, Y.
82-001468
Wakeman, J. M.
82-001586
Walker, J. H.
82-001436
Walker, M. G.
82-001520
Walker, R. L.
82-001462
Wallen, P.
82-001517
82-001563
Walsh, S. J.
82-001605
Wandsvik, A.
82-001700
82-001748
Wang, J. C. S.
82-001606
82-001774
Wanner, S. R.
82-001760

Waples, R. S.
82-001775
Ward, P.
82-001792
Ward, R. D.
82-001373
Warren, H. L., Jr.
82-001736
Wass, B.
82-001300
Watanabe, M.
82-001587
Watermann, B.
82-001861
Watkins, C. E. II
82-001788
Weatherley, A. H.
82-001518
Weaver, J. E.
82-001989
Webb, J.
82-001455
Webb, P. W.
82-001360
82-001588
Webster, D. A.
82-001949
Weihs, D.
82-001585
Weisberg, S. B.
82-001519
82-001671
Weiser, W.
82-001324
Welch, K.
82-001573
Wellner, P. K.
82-001863
Wenner, E. L.
82-001737
Wespestad, V. G.
82-001970
82-002035
Westers, H.
82-001335
Westhaus, P.
82-001607
Whitaker, D. J.
82-001777
White, B. L.
82-001301
White, E.
82-001347
Whitear, M.
82-001571
Whitney, R. R.
82-001986
Whitt, G. S.
82-001527
Whittaker, F. H.
82-001781
Whittaker, V. P.
82-001436
Wieland, C. M.
82-001557
Wilkes, P. R. H.
82-001462
Williams, E. H., Jr.
82-001862
Williams, G. H.
82-001993
Williams, I. C.
82-001854
Williams, J. S.
82-001608
Williams, R. C.
82-001342
Williams, U.
82-001914
Williamson, J. H.
82-001302
Willis, D. E.
82-001383
82-001888
Wilson, C. A.
82-001701
Wilson, J. L.
82-001738
Winfree, R. A.
82-001303
Winterbottom, R.
82-001776
Winters, G. H.
82-001658
Wishard, L.
82-001541
Wiener, R. L.
82-001762
Wissing, T. E.
82-001589
Witham, G.
82-002036
Witthames, P. R.
82-001520
Wohlschlag, D. E.
82-001586
Wolf, K.
82-001820
Wong, J.
82-001345
Wong, P. T. S.
82-001940
Wood, C. M.
82-001462
Wood, R. J.
82-001609
Woodhead, A. D.
82-001941

# AUTHOR INDEX

Woods, D. C.
82-001901
Woodward, B.
82-001334
Wootton, R.
82-001821
Wootton, R. J.
82-001673
Wrench, J. J.
82-001888
Wright, D. E.
82-001672
Wycoff, L. C.
82-001710
Wynne, D. L.
82-001589
Yabu, H.
82-001546
Yamada, J.
82-001545
Yamagata, Y.
82-001962
Yamamori, K.
82-001915
Yang, J.
82-001799
Yone, Y.
82-001414
Yoshinaka, R.
82-001492
Youakim, S.
82-001869
Young, B. H.
82-001740
Young, G.
82-001437
82-001521
Yunfei, W.
82-001719
Zabik, M. E.
82-001885
Zabik, M. J.
82-001885
Zaccone, G.
82-001522
Zama, K.
82-001392
Zandbergen, M. A.
82-001433
Zanuy, S.
82-001311
Zimmer, M. A.
82-001904
Zimmermann, F.
82-001979
Zinck, M. E.
82-001880



# GEOGRAPHICAL INDEX

Adriatic Sea
82-002022
Africa, Southern
82-001758
Africa: Kenya: Lake Victoria
82-002008
Africa: Lake Kariba
82-001743
Alabama
82-001862
Alaska
82-001280
82-001525
Alaska: Beaufort Sea
82-001591
Alaska: Bristol Bay
82-001971
Alaska: Excursion Inlet
82-001619
Alaska: Gulf of Alaska
82-001635
Arabian Sea
82-001840
Argentina
82-001762
Arizona
82-001784
Arizona: Santa Cruz Cty.
82-001718
Arkansas
82-001716
Arkansas: Mississippi River
82-001704
Asia, Southeastern
82-001768
Atlantic Ocean
82-001649
82-001685
82-002019
Atlantic Ocean, East Central
82-002024
Atlantic Ocean, North
82-001607
82-001658
82-001668
82-001701
82-001739
82-001997
82-002030
Australia
82-001692
82-001696
Australia: Great Barrier Reef
82-002028
Australia: New South Wales
82-001995
Baffin Bay
82-001550
82-001600
Beaufort Sea
82-001591
Bering Sea
82-001729
82-001970
Borneo
82-001769
Brasil: La Plata Basin
82-001760
Brazil
82-001853
California
82-001282
82-001645
82-002036
California: Golden Gate Natl. Rec. Area
82-001606
California: Sacramento-San Joaquin Estuary
82-001676
82-001774
California: San Francisco Bay
82-001725
California: Santa Clara Drainage
82-001523
Canada
82-001595
82-001749
Canada: Alberta: Sheep River
82-001880
Canada: British Columbia
82-001720
82-002031
Canada: British Columbia: Carnation Creek
82-001637
Canada: Labrador: Churchill River
82-001955
Canada: Manitoba: Brokenhead River
82-001670
Canada: Newfoundland
82-001658
82-001860
Canada: Northwest Territories: Baffin Bay
82-001550
82-001600
Canada: Ontario
82-001858
Canada: Ontario: Algonquin Park
82-001351
Caribbean Area
82-001755
Caroline Islands: Palau
82-001703
China
82-001842
China: Hainan Island
82-001857
China: Xizang
82-001719

# GEOGRAPHICAL INDEX

Colorado: Mesa Cty.
  82-001710
Colorado: Tenmile Creek
  82-001953
Colorado: Twin Lakes
  82-001350
  82-001954
  82-001959
Columbia River
  82-001948
Costa Rica
  82-001751
Dead Sea Valley
  82-001759
Egypt: Lake Quarun
  82-002007
El Salvador: Jiquilisco Bay
  82-001722
England
  82-001825
  82-001879
England: Northumberland: River Blyth
  82-001707
England: Severn Estuary
  82-001634
England: Thames Estuary
  82-001609
England: Windermere
  82-001616
Finland: Lake Suomunjarvi
  82-001622
Florida
  82-001608
  82-001656
  82-001788
Florida: Indian River Cty.
  82-001956
Genetics
  Karyotypes
  82-001524
  Polymorphism
  82-001530
Great Lakes
  82-001735
  82-001876
Greece
  82-001687
Gulf of Mexico
  82-001685
  82-001714
Hawaii
  82-001620
  82-001775
  82-002026
Illinois
  82-001642
Illinois: Lake Shelbyville
  82-001966
Indian Ocean
  82-001765
...CONTINUED...
Indian Ocean
  82-002023
Indian Ocean: Bay of Bengal
  82-001990
Indiana: Allen Cty.: Black Creek
  82-001747
Iowa: Mississippi River: Pool 9
  82-001987
Israel
  82-001281
  82-001848
Ivory Coast
  82-001308
  82-002018
Japan
  82-001631
  82-001742
Japan Sea
  82-001596
Japan: Hokkaido
  82-001598
Japan: Sagami Bay
  82-001639
Java
  82-001724
Jordan
  82-001759
Kentucky
  82-001605
  82-001736
Kentucky: Barkley Lake
  82-001389
Kentucky: Kentucky Lake
  82-001389
Kentucky: Oldham Cty.: Harrods Cree
  82-001781
Kenya: Uaso Ngiro
  82-001705
Kuwait
  82-001840
Lake Erie
  82-001343
Lake Huron
  82-001611
  82-001618
  82-001885
Lake Michigan
  82-001873
Lake Superior
  82-001693
  82-002009
  82-002010
Maine
  82-001968
Mediterranean Sea
  82-001687
  82-001848
  82-002025
Michigan
  82-001735

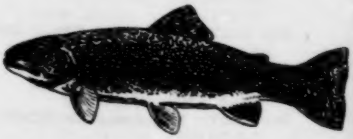
## GEOGRAPHICAL INDEX

Michigan: Ingham Cty.: Red Cedar River
  82-001786
Minnesota
  82-001721
Mississippi River
  82-001704
Missouri River
  82-001996
Mongolian People's Republic
  82-001770
Montana
  82-001540
Nebraska
  82-001534
  82-001610
Nebraska: Jefferson Cty.: Buckley Creek Reservoir
  82-001678
  82-002016
Nebraska: Keith Cty.
  82-001602
Nebraska: Lake McConaughy
  82-001584
Nebraska: Missouri River
  82-001996
Nepal
  82-001727
New Caledonia
  82-001753
New Guinea Island
  82-001752
New Hampshire
  82-001785
New Mexico
  82-001784
New York
  82-001283
  82-001949
New York: Cayuga Lake
  82-001873
New York: Hudson River
  82-001621
  82-001740
New York: Jefferson Cty.: Butterfield Lake
  82-001694
New York: Long Island
  82-001307
New York: St. Lawrence River
  82-001661
New Zealand: Glenariffe Stream
  82-001617
Nicaragua
  82-001603
Nicaragua: Lake Nicaragua
  82-002011
Nigeria
  82-002019
North Carolina
  82-001662

...CONTINUED...
North Carolina
  82-001726
North Carolina: Waccamaw River
  82-001728
North Dakota
  82-001717
North Dakota, North Central
  82-001734
North Dakota, Northeastern
  82-001708
North Dakota, Northwestern
  82-001733
North Dakota, South Central
  82-001732
North Dakota, Southeastern
  82-001731
North Sea
  82-001739
Norway
  82-001864
Ohio
  82-001589
Oklahoma
  82-001716
Oklahoma: Lake Texoma
  82-001657
Oregon
  82-001284
  82-001654
  82-001960
  82-002036
Pacific Ocean
  82-001596
  82-001624
  82-001654
  82-001696
  82-001724
  82-001749
  82-001754
  82-001762
  82-001763
  82-001764
  82-001766
  82-002027
  82-002031
  82-002033
  82-002034
  82-002036
Pacific Ocean: Great Barrier Reef
  82-002028
Panama
  82-001660
Peru: Puyango-Tumbes River
  82-002013
Philippines
  82-001295
Poland: Lake Warniak
  82-001615
Poland: Paproteckie Lake
  82-001646

# GEOGRAPHICAL INDEX

Scotland
  82-001992
Scotland: Loch Leven
  82-001674
Shetland Islands
  82-001607
South Africa
  82-001715
  82-001886
South Africa: Gamtoos Estuary
  82-001713
South Africa: Holgat Estuary
  82-001712
South Africa: Kosi
  82-001702
South Africa: Kruger Natl. Park
  82-001723
South Africa: Natal
  82-001706
South Africa: Uilkraals Estuary
  82-001711
South Carolina
  82-001628
  82-001662
  82-001701
  82-001726
South Carolina: Santee River
  82-001737
South Carolina: Waccamaw River
  82-001728
Sudan
  82-001593
Surinam
  82-001772
Taiwan
  82-001604
Tanzania
  82-001304
Tennessee
  82-001599
  82-001730
  82-001787
Tennessee: Center Hill Reservoir
  82-001683
Tennessee: Cordell Hull Reservoir
  82-001594
  82-001681
Tennessee: Holston River
  82-001738
Tennessee: Mississippi River
  82-001704
Texas
  82-001303
  82-001690
  82-001709
  82-001891
  82-001951
Texas: Lake Conroe
  82-002006
Turkey
  82-001863
United Kingdom
  82-001841
Venezuela: Lake Maracaibo
  82-001805
Virginia: Bottom Creek
  82-001652
Virginia: Claytor Lake
  82-002017
Washington
  82-001944
  82-002036
Wisconsin: Escanaba Lake
  82-001746
Wisconsin: Wapaca Cty.: Emmons Creek
  82-001958
Wyoming: Little Brooklyn Lake
  82-002005
Wyoming: Yellowstone Natl. Park: Fireho
  River
  82-001528



# SYSTEMATIC INDEX

- Abramis brama
  - Parasites/Diseases
    - 82-001808
  - Protozoan Diseases
    - 82-001808
  - Trichodina
    - 82-001808
- Acanthopagrus schlegeli
  - Variation Studies
    - 82-001544
    - 82-001545
- Acipenser
  - Age/Growth
    - 82-001698
- Aldrichetta forsteri
  - Titanium Plant Effluents
    - 82-001867
- Alosa pseudoharengus
  - Population Studies
    - 82-001611
  - Temperature
    - 82-001440
    - 82-001461
- Amia calva
  - Age/Growth
    - 82-001694
- Ammocrypta beani
  - Chemoreception
    - 82-001581
  - Fright Behavior
    - 82-001581
- Anguilla
  - Age/Growth
    - 82-001[illegible]0
  - Locomotion
    - 82-001517
  - Nervous System
    - 82-001517
- Anguilla anguilla
  - Blood Chemistry
    - 82-001449
  - Dermocystidium
    - 82-001821
  - Hypothalamic-Hypophyseal System
    - 82-001450
  - IPN
    - 82-001825
  - Parasites/Diseases
    - 82-001821
    - 82-001825
    - 82-001845
    - 82-001854
  - Protozoan Diseases
    - 82-001821
  - Sphaerostoma bramae
    - 82-001854
  - Spring Ulcer Disease
    - 82-001845
  - Stress
    - 82-001449

...CONTINUED...

- Anguilla anguilla
  - Trematodes
    - 82-001854
  - Ulcers
    - 82-001845
  - Viral Diseases
    - 82-001825
- Anguilla japonica
  - Ammonia
    - 82-001942
  - Corpuscle of Stannius
    - 82-001471
- Anguilla rostrata
  - Distribution/Geographical
    - 82-001738
- Anoplarchus purpurescens
  - Foods/Feeding
    - 82-001645
- Anoplopoma fimbria
  - Movements
    - 82-001635
- Anthias aurulentus
  - New Species
    - 82-001766
- Anthias olivaceus
  - New Species
    - 82-001766
- Apistogramma commbrae
  - Taxonomy
    - 82-001760
- Argentina silus
  - Life History/General
    - 82-001607
- Arripis trutta
  - Foods/Feeding
    - 82-001692
  - Population Studies
    - 82-001692
- Bagrus docmac
  - Exploitation Rates
    - 82-002008
  - Mortality Rates
    - 82-002008
- Barbus barbus bocagei
  - Myxobolus tauricus
    - 82-001807
  - Parasites/Diseases
    - 82-001807
  - Protozoan Diseases
    - 82-001807
- Beloniformes
  - Acoustico-Lateralis System
    - 82-001377
  - Taxonomy
    - 82-001377
- Betta splendens
  - Spawning
    - 82-001625
- Blennius pholis
  - Air Breathing
    - 82-001447

## SYSTEMATIC INDEX

...CONTINUED...
Blennius pholis
  Respiration
    82-001487
Boreogadus saida
  Habitat Selection
    82-001590
  Life History/General
    82-001591
    82-001600
Brachydanio rerio
  Embryology
    82-001443
  IPN
    82-001824
  Parasites/Diseases
    82-001824
  Viral Diseases
    82-001824
Brama japonica
  Karyotypes
    82-001546
Breviraja
  Morphology
    82-001374
  Taxonomy
    82-001374
  Variation Studies
    82-001374
Brycon melanopterus
  Ergasilus
    82-001859
  Gill Parasites
    82-001859
  Parasites/Diseases
    82-001859
  Parasitic Copepods
    82-001859
Calamoichthys calabaricus
  Air Breathing
    82-001489
  Respiration
    82-001489
Campostoma anomalum
  Distribution/Geographical
    82-001595
  Life History/General
    82-001595
  Status
    82-001595
Carangidae
  Population Studies
    82-001620
Carassius auratus
  Anoxia
    82-001513
  Ascorbic Acid
    82-001933
  Auditory Senses
    82-001554

...CONTINUED...
Carassius auratus
  Chemoreception
    82-001566
  Communication
    82-001572
  Endocrinology
    82-001438
  Enzymes
    82-001406
    82-001419
    82-001513
    82-001514
  Heavy Metals
    82-001933
  Insecticides
    82-001935
  Mercury
    82-001933
  Musculature
    82-001488
  Nervous System
    82-001557
  Nitrogen Metabolism
    82-001514
    82-001515
  Olfaction
    82-001572
  Osmoregulation
    82-001406
    82-001427
  Oxygen
    82-001575
  Pheromones
    82-001572
  Piscicides
    82-001935
  Startle Response
    82-001557
  Temperature
    82-001427
    82-001566
  Toxaphene
    82-001935
  Vision
    82-001487
Carcharhinus
  Life History/General
    82-001757
  Taxonomy
    82-001757
Carcharhinus brevipinna
  Identification
    82-001750
Carcharhinus leucas
  Exploitation Rates
    82-002011
  Harvest
    82-002011
  Management/Research--Lakes
    82-002011

...CONTINUED...
- Carcharhinus leucas
  - Population Studies
    - 82-002011
- Carcharhinus limbatus
  - Identification
    - 82-001750
- Carcharodon carcharias
  - Activity Patterns
    - 82-001551
  - Foods/Feeding
    - 82-001551
  - Metabolic Rates
    - 82-001551
  - Temperature
    - 82-001551
- Catostomus commersoni
  - Aluminum
    - 82-001892
  - Heavy Metals
    - 82-001892
  - Lissorchis attenuatus
    - 82-001847
  - Lunar Influences
    - 82-001567
  - Parasites/Diseases
    - 82-001847
  - Parsites/Diseases
    - 82-001785
  - Pineal Body
    - 82-001439
    - 82-001568
  - Temperature
    - 82-001439
    - 82-001567
    - 82-001568
  - Temperature Selection
    - 82-001439
    - 82-001567
    - 82-001568
  - Trematodes
    - 82-001847
- Catostomus plebeius
  - Variation Studies
    - 82-001527
- Catostomus santaanae
  - Population Studies
    - 82-001523
  - Variation Studies
    - 82-001523
- Caulolatilus microps
  - Foods/Feeding
    - 82-001662
- Cebidichthys violaceus
  - Foods/Feeding
    - 82-001645
- Centrarchidae
  - Age/Growth
    - 82-001682
  - Culture/Propagation
    - 82-001296

...CONTINUED...
- Centrarchidae
  - Hybridization
    - 82-001296
  - Predator/Prey Relationships
    - 82-001682
- Centropomus undecimalis
  - Bacterial Diseases
    - 82-001805
  - Lymphocystis
    - 82-001805
  - Parasites/Diseases
    - 82-001805
- Centropyge bispinosus
  - Hybridization
    - 82-001538
- Centropyge shepardi
  - Hybridization
    - 82-001538
- Chaenogobius castanea
  - Age/Growth
    - 82-001598
  - Distribution/Geographical
    - 82-001598
  - Spawning
    - 82-001598
- Chalcalburnus tarichi
  - Agricultural Processing Effluents
    - 82-001863
- Channa punctatus
  - Blood Chemistry
    - 82-001456
  - Endosulfan
    - 82-001926
  - Insecticides
    - 82-001926
  - Regeneration
    - 82-001456
- Chanos chanos
  - Culture/Propagation
    - 82-001337
  - Gamete Storage
    - 82-001337
  - Lipid Composition
    - 82-001392
- Chasmodes bosquianus
  - Spawning
    - 82-001628
- Chondrichthyes
  - Distribution/Geographical
    - 82-001709
  - Fish Lists/Keys
    - 82-001709
- Chonerhinos
  - Taxonomy
    - 82-001780
- Chrysichthys
  - Cage Culture
    - 82-001308
  - Culture/Propagation
    - 82-001308

- Chrysichthys nigrodigitatus
  - Culture/Propagation
    - 82-001314
  - Feeding Experiments
    - 82-001314
  - Feeds
    - 82-001314
- Chrysichthys walkeri
  - Culture/Propagation
    - 82-001292
  - Pond Culture
    - 82-001292
- Chrysophrys major
  - Enzymes
    - 82-001414
  - Hormones
    - 82-001414
- Cichlidae
  - Age/Growth
    - 82-001686
  - Brooding Behavior
    - 82-001578
- Clarias
  - Bibliographies
    - 82-002049
  - Life History/General
    - 82-002049
  - Taxonomy
    - 82-001771
- Clarias batrachus
  - Air Breathing
    - 82-001379
  - Carbofuran
    - 82-001925
  - Early Development
    - 82-001379
  - Respiratory System
    - 82-001379
- Clarias gariepinus
  - Fish Kills
    - 82-001886
  - Salinity
    - 82-001886
- Clevelandia ios
  - Burrowing Behavior
    - 82-001565
  - Commensalism
    - 82-001565
- Clinostomus elongatus
  - Distribution/Geographical
    - 82-001595
  - Life History/General
    - 82-001595
  - Status
    - 82-001586 .
- Clupea harengus
  - Marking/Tagging
    - 82-001977

...CONTINUED...

- Clupea harengus
  - Wire Tags
    - 82-001977
- Clupea harengus harengus
  - Age/Growth
    - 82-001650
  - Life History/General
    - 82-001609
  - Management/Research--Marine
    - 82-001609
- Clupea harengus pallasi
  - Foods/Feeding
    - 82-001601
  - Forecasting
    - 82-002031
  - Management/Research--Marine
    - 82-002031
  - Pheromones
    - 82-001601
  - Spawning
    - 82-001601
- Colisa fasciatus
  - Arsenic
    - 82-001929
  - Reproduction
    - 82-001477
- Coregonus artedii
  - Abundance
    - 82-001618
  - Harvest
    - 82-002009
  - Management/Research--Lakes
    - 82-002009
  - Population Studies
    - 82-001618
    - 82-002009
- Coregonus clupeaformis
  - Abundance
    - 82-001618
  - Organochlorines
    - 82-001874
  - Polychlorinated Biphenyls
    - 82-001873
  - Population Studies
    - 82-001618
- Coregonus lavaretus
  - Culture/Propagation
    - 82-001324
  - Feeders
    - 82-001324
  - pH
    - 82-001916
  - Xenobiotics
    - 82-001916
- Coryphaena equiselis
  - Life History/General
    - 82-001597
  - Mangement/Research--Marine
    - 82-001597

- Coryphaena hippurus
  - Life History/General
    - 82-001597
  - Management/Research--Marine
    - 82-001597
- Cottus bairdi
  - Movements
    - 82-001636
- Crenimugil labrosus
  - Foods/Feeding
    - 82-001672
- Ctenopharyngodon idella
  - Aquatic Plant Control
    - 82-001296
    - 82-001542
    - 82-001593
  - Culture/Propagation
    - 82-001296
    - 82-001542
  - Life History/General
    - 82-001593
  - Monosex Culture
    - 82-001542
  - Sex Reversal
    - 82-001542
- Cynoscion nebulosus
  - Swimming Performance
    - 82-001586
- Cyprinidae
  - Culture/Propagation
    - 82-001298
  - Fingerling Production
    - 82-001298
  - Fry Production
    - 82-001298
- Cyprinodon nevadensis nevadensis
  - Acidification
    - 82-001908
  - pH
    - 82-001908
- Cyprinodon variegatus
  - Insecticides
    - 82-001910
  - Kepone
    - 82-001910
- Cyprinus carpio
  - Age/Growth
    - 82-001681
  - Amino Acids
    - 82-001487
  - Anesthetics
    - 82-001332
  - Condition Factors
    - 82-001681
  - Culture/Propagation
    - 82-001287
    - 82-001297
    - 82-001310

...CONTINUED...

- Cyprinus carpio
  - Culture/Propagation
    - 82-001312
    - 82-001313
    - 82-001326
    - 82-001332
  - Digestive System
    - 82-001406
  - Enzymes
    - 82-001406
    - 82-001414
  - Feeding Experiments
    - 82-001310
    - 82-001312
    - 82-001313
    - 82-001326
  - Feeds
    - 82-001310
    - 82-001312
    - 82-001326
  - Foods/Feeding
    - 82-001667
    - 82-001672
  - Fry Production
    - 82-001297
  - Growth Stimulants
    - 82-001207
  - Hormones
    - 82-001414
  - Hypoxia
    - 82-001394
  - Immune Response
    - 82-001490
  - Laboratory Spawning
    - 82-001297
  - Mouth Parts
    - 82-001667
  - Musculature
    - 82-001487
  - Nutrition
    - 82-001313
  - Osmoregulation
    - 82-001406
  - Polychlorinated Biphenyls
    - 82-001885
  - Respiration
    - 82-001332
    - 82-001394
  - RNA
    - 82-001490
  - Temperature
    - 82-001490
  - Transporation
    - 82-001332
- Dascyllus
  - Karyotypes
    - 82-001539
  - Speciation
    - 82-001539
- Dascyllus aruanus
  - Spawning
    - 82-001626

- Dicentrarchus labrax
  - Culture/Propagation
    - 82-001311
  - Feeding Experiments
    - 82-001311
  - Starvation
    - 82-001311
- Diplodus sargus
  - Early Development
    - 82-001361
  - Embryology
    - 82-001361
  - Foods/Feeding
    - 82-001570
  - Swimming Performance
    - 82-001570
- Diplodus vulgaris
  - Foods/Feeding
    - 82-001570
  - Swimming Performance
    - 82-001570
- Dorosoma cepedianum
  - Age/Growth
    - 82-001681
  - Condition Factors
    - 82-001681
- Doryrhamphus
  - Taxonomy
    - 82-001754
- Draconetta pogonipa
  - New Species
    - 82-001764
- Draconetta nana
  - New Species
    - 82-001764
- Draconetta striata
  - New Species
    - 82-001764
- Draconettidae
  - Fish List/Keys
    - 82-001764
- Ebinania macquariensis
  - New Species
    - 82-001763
- Ebinania malacocephala
  - New Species
    - 82-001763
- Elacatinus janssi
  - New Species
    - 82-001751
- Embiotoca lateralis
  - Blood Chemistry
    - 82-001429
- Embiotocidae
  - Skeletal System
    - 82-001375
  - Taxonomy
    - 82-001375
- Enneacanthus obesus
  - Life History/General
    - 82-001686
- Engraulis japonica
  - Distribution/Seasonal
    - 82-001639
- Epinephelus salmoides
  - Cage Culture
    - 82-001386
  - Culture/Propagation
    - 82-001386
- Eptatretus caribbeaus
  - New Species
    - 82-001755
- Ericymba buccata
  - Abundance/Patterns of
    - 82-001767
- Esox americanus
  - Parasites/Diseases
    - 82-001788
- Esox lucius
  - Culture/Propagation
    - 82-001290
  - Fingerling Production
    - 82-001290
  - Parasites/Diseases
    - 82-001836
  - Pond Culture
    - 82-001290
  - Population Studies
    - 82-001615
  - Production
    - 82-001290
  - Viral Diseases
    - 82-001836
  - Viral Hemorrhagic Septicemia
    - 82-001836
- Esox niger
  - Parasites/Diseases
    - 82-001788
- Etheostoma
  - Aethycteron
    - 82-001850
  - Parasites/Diseases
    - 82-001850
  - Trematodes
    - 82-001850
- Etheostoma blennioides
  - Competition
    - 82-001589
  - Foods/Feeding
    - 82-001589
  - Habitat Selection
    - 82-001589
- Etheostoma caeruleum
  - Competition
    - 82-001589
  - Foods/Feeding
    - 82-001589

...CONTINUED...
Etheostoma caeruleum
  Habitat Selection
    82-001509
  Parasites/Diseases
    82-001782
Etheostoma collettei
  Distribution/Geographical
    82-001716
Etheostoma edwini
  Life History/General
    82-001648
Etheostoma spectabile
  Mortality Factors
    82-001646
  Temperature
    82-001488
Etheostoma swaini
  Chemoreception
    82-001581
  Fright Behavior
    82-001581
Etheostoma zonale
  Competition
    82-001509
  Foods/Feeding
    82-001509
  Habitat Selection
    82-001509
Etmopterus spinax
  Embryos
    82-001438
  Leydig Organ
    82-001372
Fistularia petimba
  Camouflage
    82-001564
  Coloration
    82-001564
Fistularia tabacaria
  Distribution/Geographical
    82-001760
Fugu niphobles
  Toxins
    82-001488
Fundulus
  Culture/Propagation
    82-001333
Fundulus grandis
  Baitfish Culture
    82-001300
  Culture/Propagation
    82-001300
Fundulus heteroclitus
  Age/Growth
    82-001519
  Blood Chemistry
    82-001600
  Eimeria funduli
    82-001819

...CONTINUED...
Fundulus heteroclitus
  Exercise
    82-001600
  Food Conversion Efficiency
    82-001519
    82-001671
  Foods/Feeding
    82-001671
  Heavy Metals
    82-001936
  Mercury
    82-001936
  Parasites/Diseases
    82-001819
  Protozoan Diseases
    82-001819
  Reproductive System
    82-001367
  Swimming Performance
    82-001600
Fundulus majalis
  Fin Rays
    82-001363
  Temperature
    82-001363
Fundulus notatus
  Distribution/Geographical
    82-001595
  Life History/General
    82-001895
  Status
    82-001898
Fundulus sciadicus
  Age/Growth
    82-001602
  Foods/Feeding
    82-001602
Gadus
  Management/Research-Marine
    82-001997
  Population Studies
    82-001997
Gadus morhua
  Aroclor
    82-001906
  Biochemical Composition
    82-001406
    82-001408
  Digestion Rates
    82-001453
  Digestive System
    82-001426
    82-001451
  Hormones
    82-001426
  Hypoxia
    82-001679
  Insecticides
    82-001906

...CONTINUED...
Gadus morhua
  Nervous System
    82-001400
  Nets/Netting
    82-001982
  Polychlorinated Biphenyls
    82-001986
  Reproductive System
    82-001406
  Respiration
    82-001479
Galeocerdo cuvier
  Attacks on Humans
    82-001573
Gambusia affinis
  Bird Predation
    82-001647
  Escape Behavior
    82-001548
  Insecticides
    82-001891
  Predator/Prey Relationships
    82-001647
  Temephos
    82-001891
Garra tibanica ghorensis
  New Subspecies
    82-001799
Gasterosteus aculeatus
  Age/Growth
    82-001673
  Cestodes
    82-001856
  Cyathocephalus truncatus
    82-001856
  Endocrinology
    82-001398
  Parasites/Diseases
    82-001856
  Photoperiodism
    82-001387
  Polymorphism
    82-001530
  Reproduction
    82-001387
  Saccus Vasculosus
    82-001410
  Schistocephalus solidus
    82-001856
  Spawning
    82-001633
  Temperature
    82-001673
Gastromyzon
  Taxonomy
    82-001769
Geotria australis
  Blood Chemistry
    82-001494

...CONTINUED...
Geotria australis
  Blood Chemistry
    82-001455
  Temperature
    82-001456
Gila bicolor
  Predator/Prey Relationships
    82-001554
  Schooling Behavior
    82-001554
Glaniopsis
  Taxonomy
    82-001769
Glyptocephalus cynoglossus
  Meristic Studies
    82-001356
Gobio
  Variation Studies
    82-001369
Gobiosoma bosci
  Spawning
    82-001628
Guavina guavina
  Parasites/Diseases
    82-001853
  Styphlotrema artigasi
    82-001853
  Trematodes
    82-001853
Gymnothorax enigmaticus
  Taxonomy
    82-001761
Gymnothorax ruppeli
  Taxonomy
    82-001761
Gymnotiformes
  Electric Organs
    82-001574
Halichoeres
  Taxonomy
    82-001765
Halidesmus
  Taxonomy
    82-001776
Haplochromis burtoni
  Spawning
    82-001629
  Vision
    82-001364
Hemichromis bimaculatus
  Caffeine
    82-001898
Hemiodopsis ocellata
  New Species
    82-001772
Heteropneustes fossilis
  Endocrinology
    82-001446
  Hormones
    82-001446
Heterostichus rostratus
  Spawning
    82-001627

# SYSTEMATIC INDEX

Hippoglossoides platessoides
  Digestion Rates
    82-001453
Hippoglossus stenolepis
  Fishing Gear
    82-001993
  Management/Research--Marine
    82-002029
Hyphessobrycon pulchripinnis
  Reproduction
    82-001632
  Spawning
    82-001632
Hypleurochilus geminatus
  Spawning
    82-001628
Hypophthalmichthys molitrix
  Foods/Feeding
    82-001646
Hypseleotris dayi
  Distribution/Geographical
    82-001715
Hypsoblennius ionthas
  Spawning
    82-001628
Hysterocarpus traski
  Life History/General
    82-001590
Ictalurus
  Brood Stock
    82-001288
  Culture/Propagation
    82-001288
Ictalurus furcatus
  Blood Chemistry
    82-001389
  Culture/Propagation
    82-001299
  Hybridization
    82-001299
  Induced Maturation
    82-001299
  Stress
    82-001389
Ictalurus melas
  Blood Chemistry
    82-001411
  Endocrinology
    82-001411
  Hormones
    82-001475
  Karyotypes
    82-001524
Ictalurus natalis
  Karyotypes
    82-001524
Ictalurus nebulosus
  Cadmium
    82-001907

...CONTINUED...
Ictalurus nebulosus
  Heavy Metals
    82-001907
Ictalurus punctatus
  Aeration
    82-001349
  Aeromonas hydrophila
    82-001804
  Age/Growth
    82-001678
  Ambiphrya ameiuri
    82-001811
  Anesthetics
    82-001913
    82-001920
  Bacterial Diseases
    82-001802
    82-001804
    82-001904
  Blood Chemistry
    82-001389
    82-001511
  Copper
    82-001904
  Culture/Propagation
    82-001289
    82-001293
    82-001299
    82-001303
    82-001327
  Edwardsiella ictaluri
    82-001802
  Enzymes
    82-001428
  Etomidate
    82-001920
  Feeding Experiments
    82-001303
    82-001327
  Feeds
    82-001303
    82-001327
  Formalin
    82-001899
  Genetic Strains
    82-001293
  Gill Parasites
    82-001811
  Heavy Metals
    82-001904
  Hybridization
    82-001299
  Ichthyophthiriasis
    82-001904
  Ichthyophthirius multifiliis
    82-001904
  Immune Response
    82-001802
  Induced Maturation
    82-001299

...CONTINUED...
- Ictalurus punctatus
  - Iodine
    - 82-001919
  - Rn-222
    - 82-001913
  - Nitrite
    - 82-001913
  - Parasites/Diseases
    - 82-001340
    - 82-001802
    - 82-001804
    - 82-001811
    - 82-001904
  - Pond Culture
    - 82-001340
  - Protozoan Diseases
    - 82-001811
  - Selective Breeding
    - 82-001293
  - Stress
    - 82-001309
    - 82-001511
  - Taste and Odor Problems
    - 82-001289
- Istiophoridae
  - Age/Growth
    - 82-001691
  - Management/Research--Marine
    - 82-002020
    - 82-002027
- Isurus oxyrinchus
  - Foods/Feeding
    - 82-001668
- Kareius bicoloratus
  - Abundance/Factors of
    - 82-001742
  - Life History/General
    - 82-001742
- Katsuwonus pelamis
  - Metallothionein
    - 82-001509
- Labidesthes sicculus
  - Competition
    - 82-001657
  - Foods/Feeding
    - 82-001657
- Labropsis
  - New Species
    - 82-001767
  - Taxonomy
    - 82-001767
- Lagodon rhomboides
  - Predator/Prey Relationships
    - 82-001643
- Lampetra aepyptera
  - Distribution/Geographical
    - 82-001605
  - Endocrinology
    - 82-001402

...CONTINUED...
- Lampetra aepyptera
  - Life History/General
    - 82-001605
  - Morphology
    - 82-001605
- Lampetra appendix
  - Fecundity
    - 82-001599
  - Life History/General
    - 82-001599
- Lampetra macrostoma
  - New Species
    - 82-001749
- Lateolabrax japonicus
  - Condition Factors
    - 82-001631
  - Movements
    - 82-001631
- Latimeria chalumnae
  - Electroreception
    - 82-001353
  - Rostral Organ
    - 82-001353
- Leiostomus xanthurus
  - Enzymes
    - 82-001496
  - Malate Dehydrogenase
    - 82-001496
    - 82-001497
  - Temperature
    - 82-001496
    - 82-001497
- Lepomis
  - Age/Growth
    - 82-001681
  - Condition Factors
    - 82-001681
- Lepomis auritus X Micropterus salmoides
  - Hybridization
    - 82-001536
- Lepomis gibbosus
  - Trophic Relationships
    - 82-001665
- Lepomis gulosus
  - Foods/Feeding
    - 82-001665
  - Trophic Relationships
    - 82-001665
- Lepomis macrochirus
  - Abundance/Factors of
    - 82-001613
  - Age/Growth
    - 82-001594
  - Anesthetics
    - 82-001920
  - Bioassay Techniques
    - 82-001469
  - Etomidate
    - 82-001920

...CONTINUED...
Lepomis macrochirus
  Foods/Feeding
    82-001594
    82-001665
  Foods/Feeding/Selectivity
    82-001644
  Management/Research--Reservoirs
    82-001594
  Parasites/Diseases
    82-001787
    82-001788
  Population Studies
    82-001594
    82-001613
  Predator/Prey Relationships
    82-001644
    82-001663
  Respiration
    82-001469
  Trophic Relationships
    82-001665
  Year Class Strength
    82-001613
Lepomis macrochirus X Micropterus salmoides
  Hybridization
    82-001536
Lepomis megalotis
  Age/Growth
    82-001594
  Foods/Feeding
    82-001594
  Management/Research--Reservoirs
    82-001594
  Population Studies
    82-001594
Lepomis microlophus X Micropterus salmoides
  Hybridization
    82-001536
Lepomus gibbosus
  Foods/Feeding
    82-001665
Leuciscus leuciscus
  Abundance/Factors of
    82-001744
  Mortality Factors
    82-001744
  Rheotropism
    82-001577
Leuresthes tenuis
  Abundance/Factors of
    82-001403
  Temperature
    82-001403
Limanda herzensteini
  Abundance/Factors of
    82-001742
  Life History/General
    82-001742
Limanda limanda
  Parasites/Diseases
    82-001861
Limanda yokohamae
  Reproduction
    82-001476
Limnothrissa miodon
  Abundance/Factors of
    82-001743
  Biochemical Composition
    82-001399
  Flow Regimes
    82-001743
  Harvest
    82-001743
  Management/Research--Reservoirs
    82-001743
Liopsetta putnami
  Culture/Propagation
    82-001309
  Heated Water
    82-001309
Liza aurata
  Culture/Propagation
    82-001305
  Pond Culture
    82-001305
  Temperature
    82-001305
Lopholatilus chamaeleonticeps
  Burrowing Behavior
    82-001547
Loricariidae
  Foods/Feeding
    82-001660
Lucania parva
  Escape Behavior
    82-001548
Lutjanidae
  Population Studies
    82-001620
Lutjanus campechanus
  Age/Growth
    82-001685
  Length-Weight Relationships
    82-001685
  Mortality Rates
    82-001685
Macrozoarces americanus
  Digestion Rates
    82-001453
Makaira indica
  Life History/General
    82-002033
  Management/Research--Marine
    82-002033
Mallotus villosus
  Age/Growth
    82-001582
  Enzymes
    82-001423
  Swimming Performance
    82-001582

...CONTINUED...
- Mallotus villosus
  - Temperature
    - 82-001592
- Melanogrammus aeglefinus
  - Reproductive System
    - 82-001378
- Menidia beryllina
  - Competition
    - 82-001657
  - Foods/Feeding
    - 82-001657
- Menidia menidia
  - Abundance/Factors of
    - 82-001741
  - Movements
    - 82-001741
  - Sex Determination
    - 82-001741
  - Spawning
    - 82-001741
  - Temperature
    - 82-001741
- Menidia peninsulae
  - Foods/Feeding
    - 82-001656
  - Life History/General
    - 82-001656
- Merluccius productus
  - Parasites/Diseases
    - 82-001816
  - Protozoan Diseases
    - 82-001816
- Micromesistius poutassou
  - Life History/General
    - 82-001612
  - Population Studies
    - 82-001612
- Microphis cruentus
  - New Species
    - 82-001753
- Micropterus
  - Culture/Propagation
    - 82-001531
  - Electrophoresis
    - 82-001531
  - Genetic Strains
    - 82-001531
- Micropterus salmoides
  - Age/Growth
    - 82-001594
    - 82-001684
    - 82-001699
  - Culture/Propagation
    - 82-001302
  - Digestion Rates
    - 82-001648
    - 82-001664
  - Electrofishing
    - 82-001983

...CONTINUED...
- Micropterus salmoides
  - Electrophoresis
    - 82-001532
  - Feeding Experiments
    - 82-001302
  - Foods/Feeding
    - 82-001594
    - 82-001648
    - 82-001665
  - Foods/Feeding/Selectivity
    - 82-001664
  - Genetic Strains
    - 82-001302
  - Helminths
    - 82-001852
  - Management/Research--Reservoirs
    - 82-001594
  - Nets/Netting
    - 82-001983
  - Otoliths
    - 82-001684
    - 82-001699
  - Parasites/Diseases
    - 82-001852
  - Population Studies
    - 82-001594
    - 82-001983
  - Predator/Prey Relationships
    - 82-001663
    - 82-001664
  - Sampling
    - 82-001983
  - Trophic Relationships
    - 82-001665
- Micropterus salmoides floridanus
  - Culture/Propagation
    - 82-001301
- Minytrema melanops
  - Lissorchis
    - 82-001843
  - Parasites/Diseases
    - 82-001843
  - Trematodes
    - 82-001843
- Misgurnus anguillicaudatus
  - Enzymes
    - 82-001473
  - Reproduction
    - 82-001473
  - Reproductive System
    - 82-001376
- Mormyriformes
  - Electric Organs
    - 82-001574
- Morone americana
  - Embryology
    - 82-001465
  - Life History/General
    - 82-001610

...CONTINUED...
Morone americana
  Management/Research--General
    82-001610
  Population Studies
    82-001621
  Salinity
    82-001465
  Temperature
    82-001465
  Year Class Strength
    82-001621
Morone chrysops
  Age/Growth
    82-001683
    82-001690
  Length-Weight Relationships
    82-001690
Morone mississippiensis
  Distribution/Geographical
    82-001730
Morone saxatilis
  Age/Growth
    82-001676
    82-001690
  Culture/Propagation
    82-001286
    82-001325
  Feeding Experiments
    82-001325
  Feeds
    82-001325
  Fingerling Production
    82-001286
  Length-Weight Relationships
    82-001690
  Movements
    82-001638
  Pond Culture
    82-001286
Morone saxatilis X M. chrysops
  Age/Growth
    82-001690
  Hybridization
    82-002015
  Length-Weight Relationships
    82-001690
  Management/Research--Ponds
    82-002015
Moxostoma erythrurum
  Age/Growth
    82-001681
  Condition Factors
    82-001681
Mugil auratus
  Endocrinology
    82-001445
  Reproduction
    82-001445
Mugil cephalus
  Distribution/Geographical
    82-001725

...CONTINUED...
Mugil cephalus
  Endocrinology
    82-001445
  Ergasilus
    82-001851
  Gill Parasites
    82-001851
  Life History/General
    82-001604
  Management/Research--Lakes
    82-002007
  Management/Research--Marine
    82-001604
  Parasites/Diseases
    82-001851
  Parasitic Copepods
    82-001851
  Population Studies
    82-001604
  Reproduction
    82-001445
Mullus barbatus
  Age/Growth
    82-001687
  Carotenoids
    82-001396
  Maturation
    82-001687
Muraenidae
  Taxonomy
    82-001761
Myoxocephalus octodecimspinosus
  Oil
    82-001914
  Osmoregulation
    82-001395
Nemachilus longianalis
  New Subspecies
    82-001719
Nemadactylus macropterus
  Age/Growth
    82-001696
Nemamyxine kreffti
  New Species
    82-001762
Notemigonus crysoleucas
  Anesthetics
    82-001920
  Etomidate
    82-001920
Notopterus chitala
  Auditory Senses
    82-001553
Nototheniidae
  Buoyancy Adjustment
    82-001556
Notropis cornutus
  Eimeria
    82-001817

...CONTINUED...
Notropis cornutus
  Parasites/Diseases
    82-001817
  Protozoan Diseases
    82-001817
Notropis photogenis
  Distribution/Geographical
    82-001595
  Life History/General
    82-001595
  Status
    82-001595
Ompok bimaculatus
  Endocrinology
    82-001418
  Nervous System
    82-001418
Oncorhynchus
  Limited Entry
    82-001971
  Management/Research--General
    82-001944
    82-001948
  Marking/Tagging
    82-001975
    82-001976
  Movements
    82-001641
  Regulations
    82-001971
  Wire Tags
    82-001976
Oncorhynchus gorbuscha
  Culture/Propagation
    82-001535
  Distribution/Geographical
    82-001735
  Hybridization
    82-001535
Oncorhynchus keta
  Bacterial Diseases
    82-001801
  Culture/Propagation
    82-001284
    82-001315
    82-001316
    82-001331
  Diets
    82-001316
  Electrophoresis
    82-001525
  Fecundity
    82-001624
  Feeding Experiments
    82-001315
    82-001316
  Fish Stocks
    82-001619
  Movements
    82-001640

...CONTINUED...
Oncorhynchus keta
  Nutrition
    82-001315
  Ocean Ranching
    82-001284
  Osmoregulation
    82-001431
  Parasites/Diseases
    82-001801
  Salinity
    82-001431
  Stocking/Introductions
    82-001640
  Transportation
    82-001331
  Variation Studies
    82-001525
  Vibriosis
    82-001801
  Vitamins
    82-001315
Oncorhynchus kisutch
  Aroclor 1254
    82-001905
  Bacterial Diseases
    82-001800
  Competition
    82-001651
  Copper
    82-001897
    82-001923
  Culture/Propagation
    82-001285
  Endocrinology
    82-001505
  Fecundity
    82-001624
  Foods/Feeding
    82-001651
  Heavy Metals
    82-001897
    82-001923
  Hormones
    82-001505
  Immunization
    82-001800
  Induced Maturation
    82-001285
    82-001504
  Management/Research--Marine
    82-002036
  Movements
    82-001637
  Oil
    82-001905
  Organochlorines
    82-001917
  Parasites/Diseases
    82-001800

...CONTINUED...
- Oncorhynchus kisutch
  - Polychlorinated Biphenyls
    - 82-001873
    - 82-001905
  - Reproduction
    - 82-001505
  - Sex Determination
    - 82-001533
  - Stocking/Introductions
    - 82-001980
    - 82-001981
    - 82-001981
  - Yersinia ruckeri
    - 82-001800
- Oncorhynchus masou
  - Age/Growth
    - 82-001689
  - Fish Stocks
    - 82-001359
  - IHN
    - 82-001826
  - Meristic Studies
    - 82-001359
  - Orientation/Homing
    - 82-001579
  - Otoliths
    - 82-001371
  - Parasites/Diseases
    - 82-001826
  - Viral Diseases
    - 82-001826
- Oncorhynchus rhodurus
  - Endocrinology
    - 82-001437
    - 82-001521
  - Reproduction
    - 82-001437
    - 82-001521
- Oncorhynchus tshawytscha
  - Management/Research--Marine
    - 82-002036
  - Polychlorinated Biphenyls
    - 82-001873
  - Population Studies
    - 82-001617
- Oplegnathus fasciatus
  - Insecticides
    - 82-001932
  - Organophosphates
    - 82-001932
- Opsanus beta
  - Osmoregulation
    - 82-001395
    - 82-001407
  - pH Regulation
    - 82-001407
- Opsanus tau
  - Age/Growth
    - 82-001701

...CONTINUED...
- Opsanus tau
  - Blood Chemistry
    - 82-001446
  - Foods/Feeding
    - 82-001701
  - Osmoregulation
    - 82-001446
- Oryzias latipes
  - Embryology
    - 82-001409
  - Enzymes
    - 82-001409
  - Flame Retardants
    - 82-001931
  - Phosphoric Acid Triesters
    - 82-001931
- Osmerus mordax
  - Age/Growth
    - 82-001693
  - Distribution/Geographical
    - 82-001704
  - Mortality Rates
    - 82-001693
  - Parasites/Diseases
    - 82-001832
  - Piscine Erythrocytic Necrosis
    - 82-001832
  - Population Studies
    - 82-001611
  - Viral Diseases
    - 82-001832
- Pagrus major
  - Blood Chemistry
    - 82-001430
  - Oxygen
    - 82-001430
- Papichthys mongoliensis
  - Paleontology
    - 82-001770
- Paralichthys albigutta
  - Predator/Prey Relationships
    - 82-001643
- Parasilurus asotus
  - Barbels
    - 82-001358
  - Taste Reception
    - 82-001358
- Parophrys vetulus
  - Blood Chemistry
    - 82-001462
  - Foods/Feeding
    - 82-001654
  - Predator/Prey Relationships
    - 82-001654
- Parupeneus porphyreus
  - Camouflage
    - 82-001564
  - Coloration
    - 82-001564

## SYSTEMATIC INDEX

- Poeciliopsis occidentalis
  - Distribution/Geographical
    - 82-001718
- Perca flavescens
  - Abundance
    - 82-001618
  - Age/Growth
    - 82-001695
  - Biomagnification
    - 82-001875
  - Enzymes
    - 82-001620
  - Foods/Feeding
    - 82-001665
  - Manganese
    - 82-001875
  - Population Studies
    - 82-001618
  - Power Plant Effluents
    - 82-001875
  - Radionuclides
    - 82-001875
  - Trophic Relationships
    - 82-001665
- Perca fluviatilis
  - Nets/Netting
    - 82-001985
  - Population Studies
    - 82-001622
  - Vision
    - 82-001366
- Percina nigrofasciata
  - Chemoreception
    - 82-001581
  - Fright Behavior
    - 82-001581
- Peristediidae
  - Taxonomy
    - 82-001758
- Petromyzon marinus
  - Endocrinology
    - 82-001391
  - Hormones
    - 82-001391
  - Organochlorines
    - 82-001874
- Petromyzontidae
  - Taxonomy
    - 82-001773
- Petroscirtes variabilis
  - Foods/Feeding
    - 82-001677
  - Sexual Dimorphism
    - 82-001677
- Phoxinus eos X P. neogaeus
  - Hybridization
    - 82-001534
- Phoxinus phoxinus
  - Rheotropism
    - 82-001377
- Pimephales promelas
  - Benzene
    - 82-001901
  - Eimeria
    - 82-001817
  - Escape Behavior
    - 82-001588
  - Naphthalene
    - 82-001901
  - Parasites/Diseases
    - 82-001817
  - Protozoan Diseases
    - 82-001817
  - Toluene
    - 82-001902
- Platichthys flesus
  - Biomagnification
    - 82-001937
  - Copper
    - 82-001937
  - Heavy Metals
    - 82-001937
- Platichthys stellatus
  - Metamorphosis
    - 82-001481
- Plecoglossus altivelis
  - Culture/Propagation
    - 82-001318
  - Feeding Experiments
    - 82-001318
  - Feeds
    - 82-001318
  - Nutrition
    - 82-001318
- Plectroglyphidodon johnstonianus
  - Social Behavior
    - 82-001630
  - Spawning
    - 82-001630
- Pleuronectes platessa
  - Age/Growth
    - 82-001317
  - Culture/Propagation
    - 82-001317
  - Electrophoresis
    - 82-001373
  - Enzymes
    - 82-001373
  - Feeding Experiments
    - 82-001317
  - Metabolic Rates
    - 82-001434
  - Variation Studies
    - 82-001373
- Pleuronectes yokohamae
  - Abundance/Factors of
    - 82-001742
  - Life History/General
    - 82-001742

# SYSTEMATIC INDEX

Pleuronichthys coenosus
  Life History/General
    82-001596
Poecilia formosa
  Aromatic Hydrocarbons
    82-001961
Poecilia latipinna
  Age/Growth
    82-001697
Poecilia reticulata
  Coloration
    82-001367
  Pheromones
    82-001463
Polyodon spathula
  Caudal Neurosecretory System
    82-001390
  Electroreception
    82-001415
Pomatomus saltatrix
  Swimming Performance
    82-001576
Pomoxis annularis
  Age/Growth
    82-001596
  Foods/Feeding
    82-001596
  Management/Research--Reservoirs
    82-001596
  Population Studies
    82-001596
Pristis perotteti
  Exploitation Rates
    82-002011
  Harvest
    82-002011
  Life History/General
    82-001603
  Management/Research--Lakes
    82-002011
  Population Studies
    82-002011
Protopterus annectens brieni
  Distribution/Geographical
    82-001723
Pseudopleuronectes americanus
  Culture/Propagation
    82-001309
  Digestion Rates
    82-001453
  Excretory System
    82-001483
  Heated Water
    82-001309
  Osmoregulation
    82-001485
  Vision
    82-001580
Psychrolutidae
  Taxonomy
    82-001763
Raja clavata
  Abnormalities
    82-001365
  Fins
    82-001365
Raja eglanteria
  Acoustico-Lateralis System
    82-001355
  Nervous System
    82-001368
Rhinichthys atratulus
  Predator/Prey Relationships
    82-001679
Rhinichthys osculus
  Distribution/Geographical
    82-001720
  Status
    82-001720
Richardsonius balteatus
  Distribution/Geographical
    82-001710
Rutilus rutilus
  Digestion Rates
    82-001478
  Digestive System
    82-001424
  Parasites/Diseases
    82-001808
  Protozoan Diseases
    82-001808
  Rheotropism
    82-001577
  Trichodina
    82-001808
Salmo clarki lewisi
  Electrophoresis
    82-001540
Salmo gairdneri
  Abnormalities
    82-001362
  Adrenalin
    82-001476
  Aeromonas salmonicida
    82-001795
    82-001797
  Age/Growth
    82-001688
  Anesthetics
    82-001912
  Ascorbic Acid
    82-001492
  Bacterial Diseases
    82-001790
    82-001792
    82-001795
    82-001797

...CONTINUED...
Salmo gairdneri
- Bacterial Diseases
  - 82-001800
- Bacterial Kidney Disease
  - 82-001790
- Benzene
  - 82-001901
- Biochemical Composition
  - 82-001452
  - 82-001499
- Biomagnification
  - 82-001883
- Blood Chemistry
  - 82-001401
  - 82-001422
  - 82-001464
  - 82-001493
  - 82-001501
- Cardio-Vascular System
  - 82-001397
  - 82-001406
  - 82-001512
- Cestodes
  - 82-001829
- Chlorine
  - 82-001464
- Coloration
  - 82-001362
- Copper
  - 82-001868
  - 82-001909
- Cortisol
  - 82-001493
- Culture/Propagation
  - 82-001320
  - 82-001321
  - 82-001323
  - 82-001326
  - 82-001330
  - 82-001336
  - 82-001342
- Cyanide
  - 82-001918
- Diets
  - 82-001321
- Digestive System
  - 82-001354
- Egtved Virus
  - 82-001839
- Electrophoresis
  - 82-001528
  - 82-001541
- Endocrinology
  - 82-001413
  - 82-001417
- Exercise
  - 82-001404
- Feeding Experiments
  - 82-001320

...CONTINUED...
Salmo gairdneri
- Feeding Experiments
  - 82-001321
  - 82-001323
  - 82-001326
- Foods
  - 82-001320
  - 82-001326
  - 82-001330
- Filteration Systems
  - 82-001336
- Fluoride
  - 82-001330
- Foods/Feeding/Selectivity
  - 82-001655
- Furunculosis
  - 82-001795
- Genetic Strains
  - 82-001541
  - 82-001584
- Geothermal Effects
  - 82-001528
- Heavy Metals
  - 82-001868
  - 82-001889
  - 82-001909
  - 82-001915
  - 82-001921
- Hormones
  - 82-001417
  - 82-001512
- Immune Response
  - 82-001491
- Immunization
  - 82-001792
  - 82-001800
- IPN
  - 82-001822
- Iron
  - 82-001889
- Management/Research--General
  - 82-001948
- Metabolic Rates
  - 82-001518
- Myxosoma cerebralis
  - 82-001820
- Naphthalene
  - 82-001901
- Nickel
  - 82-001868
- Parasites/Diseases
  - 82-001790
  - 82-001792
  - 82-001795
  - 82-001797
  - 82-001800
  - 82-001813
  - 82-001820
  - 82-001822
  - 82-001829
  - 82-001839

...CONTINUED...
- Salmo gairdneri
  - pH
    - 82-001896
  - Pineal Body
    - 82-001507
  - Pollution Avoidance
    - 82-001866
    - 82-001868
  - Proliferative Kidney Disease
    - 82-001813
  - Proteocephalus parcae
    - 82-001829
  - Protozoan Diseases
    - 82-001813
    - 82-001820
  - Radionuclides
    - 82-001883
  - Recirculating Systems
    - 82-001338
    - 82-001342
  - Resin Acids
    - 82-001928
  - Respiration
    - 82-001501
    - 82-001518
  - Saccus Vasculosus
    - 82-001433
  - Temperature
    - 82-001401
    - 82-001499
    - 82-001512
    - 82-001584
  - Temperature Selection
    - 82-001584
  - Thorium
    - 82-001883
  - Uranium
    - 82-001883
  - Vanadium
    - 82-001909
  - Vibrio anguillarum
    - 82-001792
    - 82-001796
    - 82-001797
  - Vibriosis
    - 82-001792
    - 82-001795
  - Viral Diseases
    - 82-001822
    - 82-001839
  - Whirling Disease
    - 82-001820
  - Yersinia ruckeri
    - 82-001800
  - Zinc
    - 82-001915
    - 82-001921
- Salmo salar
  - Buoyancy Adjustment
    - 82-001582

...CONTINUED...
- Salmo salar
  - Culture/Propagation
    - 82-001535
  - Gradient
    - 82-001569
  - Habitat Selection
    - 82-001569
  - Hybridization
    - 82-001535
  - Management/Research--General
    - 82-001949
  - Orientation/Homing
    - 82-001552
  - Parasites/Diseases
    - 82-001780
    - 82-001810
  - Pheromones
    - 82-001559
  - Proliferative Kidney Disease
    - 82-001810
  - Protozoan Diseases
    - 82-001810
  - Riboflavin
    - 82-001559
  - Spawning Migration
    - 82-001634
  - Ulcerative Dermal Necrosis
    - 82-001780
- Salmo trutta
  - Aeromonas salmonicida
    - 82-001789
  - Age/Growth
    - 82-001616
    - 82-001674
  - Bacterial Diseases
    - 82-001789
  - Buoyancy Adjustment
    - 82-001582
  - Calcium
    - 82-001896
  - Chloromyxum truttae
    - 82-001806
  - Competition
    - 82-001651
  - Electrophoresis
    - 82-001543
  - Foods/Feeding
    - 82-001651
    - 82-001652
  - Gradient
    - 82-001569
  - Habitat Selection
    - 82-001569
  - Mortality Rates
    - 82-001616
  - Parasites/Diseases
    - 82-001780
    - 82-001789
    - 82-001806

...CONTINUED...
Salmo trutta
  Parasites/Diseases
    82-001818
  pH
    82-001806
  Polychlorinated Biphenyls
    82-001873
  Population Studies
    82-001616
  Predator/Prey Relationships
    82-001652
  Proliferative Kidney Disease
    82-001810
  Protozoan Diseases
    82-001806
    82-001810
  Ulcerative Dermal Necrosis
    82-001788
Salmo trutta lacustris
  Culture/Propagation
    82-001283
  Endocrinology
    82-001502
  Hormones
    82-001502
Salmonidae
  Bacterial Diseases
    82-001793
    82-001794
  Clearcutting
    82-001960
  Forestry Practices
    82-001960
  IHN
    82-001818
  Immunization
    82-001793
    82-001794
    82-001837
  IPN
    82-001818
  Management/Research--Rivers and Streams
    82-001953
  Parasites/Diseases
    82-001793
    82-001794
    82-001818
    82-001837
  Parr-Smolt Transformation
    82-001385
  Road Construction
    82-001953
  Stream Improvement/General
    82-001953
  Stream Relocation
    82-001953
  Vibrio anguillarum
    82-001793
    82-001794

...CONTINUED...
Salmonidae
  Viral Diseases
    82-001818
    82-001837
  Viral Hemorrhagic Septicemia
    82-001837
  Yersinia ruckeri
    82-001793
    82-001794
Salvelinus
  Skeletal System
    82-001382
Salvelinus alpinus
  Abundance/Factors of
    82-001748
  Age/Growth
    82-001700
  Mortality Factors
    82-001748
  Nets/Netting
    82-001985
  Osmoregulation
    82-001748
  Temperature
    82-001700
Salvelinus fontinalis
  Aluminum
    82-001892
  Aroclor
    82-001888
  Competition
    82-001651
  Endrin
    82-001924
  Enzymes
    82-001383
  Fish Control/Removal
    82-002005
  Foods/Feeding
    82-001651
  Heavy Metals
    82-001892
  Insecticides
    82-001924
  Management/Research--Lakes
    82-002005
  Myxosoma cerebralis
    82-001820
  Parasites/Diseases
    82-001820
  Polychlorinated Biphenyls
    82-001888
  Protozoan Diseases
    82-001820
  Temperature
    82-001503
  Turbidity
    82-001542
  Variation Studies
    82-001537

# SYSTEMATIC INDEX

...CONTINUED...
- Salvelinus fontinalis
  - Whirling Disease
    - 82-001820
- Salvelinus fontinalis X S. namaycush
  - pH
    - 82-001616
  - Xenobiotics
    - 82-001916
- Salvelinus namaycush
  - Artificial Spawning Beds
    - 82-002010
  - Heavy Metals
    - 82-001881
  - Management/Research--Lakes
    - 82-002010
  - Mercury
    - 82-001881
  - Polychlorinated Biphenyls
    - 82-001873
- Sagrus auratus
  - Culture/Propagation
    - 82-001319
- Sardinops melanosticta
  - Nerocila phaeopleura
    - 82-001855
  - Parasites/Diseases
    - 82-001855
  - Parasitic Copepods
    - 82-001855
- Sarotherodon
  - Distribution/Geographical
    - 82-001705
  - Haplorchis pumilio
    - 82-001835
    - 82-001836
  - Parasites/Diseases
    - 82-001835
    - 82-001836
  - Trematodes
    - 82-001835
    - 82-001836
- Saurida
  - Taxonomy
    - 82-001775
- Scarus taeniopterus
  - Activity Patterns
    - 82-001555
- Schizopygopsis microcephalus namensis
  - New Subspecies
    - 82-001719
- Scomber scombrus
  - Respiration
    - 82-001425
- Scombridae
  - Management/Research--Marine
    - 82-002034
- Scyliorhinus
  - Locomotion
    - 82-001517

...CONTINUED...
- Scyliorhinus
  - Nervous System
    - 82-001517
- Scyliorhinus canicula
  - Heavy Metals
    - 82-001939
  - Zinc
    - 82-001939
- Sebastolobus
  - Enzymes
    - 82-001900
- Semotilus atromaculatus
  - Predator/Prey Relationships
    - 82-001670
  - Turbidity
    - 82-001542
- Semotilus margarita
  - Foods/Feeding
    - 82-001670
- Seriola dumerili
  - Bucephalus gorgon
    - 82-001846
  - Parasites/Diseases
    - 82-001846
  - Trematodes
    - 82-001846
- Seriola quinqueradiata
  - Enzymes
    - 82-001414
  - Hormones
    - 82-001414
- Serranidae
  - Distribution/Geographical
    - 82-001714
  - Population Studies
    - 82-001620
- Siganus canalicullatus
  - Culture/Propagation
    - 82-001304
- Sillago bassensis
  - Titanium Plant Effluents
    - 82-001867
- Sparus auratus
  - Culture/Propagation
    - 82-001329
  - Feeding Experiments
    - 82-001319
    - 82-001329
  - Feeds
    - 82-001319
    - 82-001329
  - Foods/Feeding
    - 82-001570
  - Swimming Performance
    - 82-001570
- Squalus acanthias
  - Enzymes
    - 82-001432
  - Osmoregulation
    - 82-001407

## SYSTEMATIC INDEX

...CONTINUED...
Squalus acanthias
  pH Regulation
    82-001407
  Swimming Performance
    82-001563
Stegastes fasciolatus
  Social Behavior
    82-001630
  Spawning
    82-001630
Stemonosudis rothschildi
  Distribution/Geographical
    82-001724
Stizostedion canadense
  Age/Growth
    82-001594
  Foods/Feeding
    82-001594
  Management/Research--Reservoirs
    82-001594
  Population Studies
    82-001594
Stizostedion vitreum vitreum
  Abundance/Factors of
    82-001746
  Age/Growth
    82-001746
  Electrophoresis
    82-002017
  Genetic Strains
    82-002017
  Mangement/Research--Reservoirs
    82-002017
Tetraodontidae
  Taxonomy
    82-001768
Theragra chalcogramma
  Economic Values
    82-001970
  Parasites/Diseases
    82-001777
Thunnus thynnus
  Culture/Propagation
    82-001336
  Gamete Storage
    82-001336
Thymallus arcticus
  Foods/Feeding
    82-001646
Tilapia
  Cage Culture
    82-001295
  Culture/Propagation
    82-001291
    82-001295
  Distribution/Geographical
    82-001705
  Haplorchis pumilio
    82-001835

...CONTINUED...
Tilapia
  Haplorchis pumilio
    82-001836
  Hybridization
    82-001529
  Parasites/Diseases
    82-001835
    82-001836
  Polyculture
    82-001291
  Trematodes
    82-001835
    82-001836
Tilapia aurea
  Digestive System
    82-001482
Tilapia mossambica
  Brooding Behavior
    82-001587
  Caudal Neurosecretory System
    82-001457
  Distribution/Geographical
    82-001706
  Endocrinology
    82-001412
    82-001457
    82-001458
  Heavy Metals
    82-001936
  Hormones
    82-001412
  Osmoregulation
    82-001412
    82-001457
    82-001458
Tilapia nilotica
  Culture/Propagation
    82-001322
  Early Development
    82-001370
  Embryology
    82-001370
  Exploitation Rates
    82-002008
  Feeding Experiments
    82-001322
  Mortality Rates
    82-002008
  Vitamins
    82-001322
Tilapia variabilis
  Exploitation Rates
    82-002008
  Mortality Rates
    82-002008
Torpedo marmorata
  Electrophysiology
    82-001436
Trichiurus haumela
  Parasites/Diseases
    82-001842

# SYSTEMATIC INDEX

...CONTINUED...
Trichiurus haumela
  Trematodes
    82-001842
Triglidae
  Taxonomy
    82-001758
Xererpes fucorum
  Foods/Feeding
    82-001645
Xiphiidae
  Age/Growth
    82-001691
Xiphister atropurpureus
  Foods/Feeding
    82-001645
Xiphister mucosus
  Foods/Feeding
    82-001645
Xiphophorus
  Maturation
    82-001384
Xiphophorus maculatus
  Endocrinology
    82-001494
  Hormones
    82-001495
  Reproduction
    82-001494
    82-001495
Xyrichthys novacula
  Endocrinology
    82-001522
Zenarchopterus alleni
  New Species
    82-001752
Zenarchopterus robertsi
  New Species
    82-001752
Zoarces viviparus
  Diplostomum spathaceum
    82-001850
  Enzymes
    82-001444
  Parasites/Diseases
    82-001850
  Reproduction
    82-001444
  Trematodes
    82-001850

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# SPORT FISHERY ABSTRACTS

*Roger Schoumacher, Editor*
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CONTENTS

AQUATIC PLANTS AND THEIR CONTROL........................................ 1

CULTURE AND PROPAGATION

General Fish Culture........................................ 1
Trout and Salmon Culture........................................ 1
Other Anadromous Species Culture........................................ 2
Warmwater Culture........................................ 2
Mariculture........................................ 4
Feeds, Feeding and Nutrition........................................ 4
Transporting Fish........................................ 8
Aquariums........................................ 8
Miscellaneous Culture Techniques and Equipment........................................ 8

LIMNOLOGY AND OCEANOGRAPHY

General........................................ 9
Physical........................................ 10
Chemical........................................ 10
Benthos........................................ 10

ORPHOLOGY, PHYSIOLOGY, GENETICS AND BEHAVIOR

Morphology........................................ 11
Physiology........................................ 22
Genetics, Variation Studies, Hybridization........................................ 41
Behavior........................................ 44

ATURAL HISTORY

Life Histories - General Works........................................ 48
Population Studies - Production, Standing Crop, Recruitment. 55
Spawning Habits and Movements, Sex Ratios, Fecundity, etc... 59
Movements, Seasonal and Depth Distribution, etc........................................ 64
Foods and Feeding........................................ 67
Age and Growth........................................ 76
Geographical Distribution, Fish surveys, etc........................................ 82
Abundance, Factors of; Survival and Mortality........................................ 88
Identification, Keys, Classification........................................ 90

ARASITES AND DISEASES

General........................................ 95
Bacterial........................................ 96
Fungal........................................ 98
Protozoan........................................ 98
Viral........................................ 98
Other........................................ 99

## POLLUTION AND TOXICOLOGY

Pollution.......... 104
Fish Kills.......... 109
Toxicology; Bioassays.......... 109
Fish Toxicants.......... 115

## RESEARCH AND MANAGEMENT

General.......... 116
Administration and Planning.......... 117
Reports of Fishery Stations, States, etc.......... 118
Habitat Alteration.......... 118
Harvest, Creel Census, etc.......... 122
Regulations.......... 123
Fish Control and Removal.......... 125
Marking and Tagging.......... 125
Stocking and Introductions.......... 126
Fishing Gear and Techniques.......... 127
Fertilization of Water and Soil.......... 129
Fishways, Fish Passage through Dams, etc.......... 129
Mathematical, Statistical Methods and Modeling.......... 130
Lake Management and Research.......... 131
River and Stream Management and Research.......... 132
Farm Pond and Small Impoundment Management and Research.......... 133
Large Impoundment Management and Research.......... 134
Estuary Management and Research.......... 135
Marine Management and Research.......... 136
Utilization of Fishery Products.......... 138
Miscellaneous Techniques and Equipment.......... 138
Reviews, Bibliographies, etc.......... 139

CUMULATIVE AUTHOR INDEX (Salmon).......... 141
CUMULATIVE GEOGRAPHIC INDEX (Yellow).......... 231
CUMULATIVE SYSTEMATIC INDEX (Blue).......... 247
CUMULATIVE SYBJECT INDEX (White).......... 331
LIST OF PUBLICATIONS SCREENED.......... 377

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# SPORT FISHERY ABSTRACTS

## AQUATIC PLANTS AND THEIR CONTROL

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[Inst. Environ. Biol., Univ. Lodz, Banacha 12/16, 90-237 Lodz, Poland
The cage aquaculture of rainbow trout, *Salmo gairdneri* Richardson, enriche the mesotrophic Glebokie Lake with carbon, phosphorus and nitrogen. Tw generations were studied, from their introduction to the cages as 0 grou trout in June untiltheir removal as marketable trout in the Autumn of th following year. An inter-generation budget of energy and bioelement (C,P,N) showed that, for every kilogram of marketable trout produced, th lake was enriched by 0.75kg C, 0.023kg P and 0.10kg N (27.91, 0.84 and 3.5 $g\ m^{-2} yr^{-1}$ respectively). This eutrophication is expected to cause the los of the natural populations of Coregonidae. The values of $K_1$, $K_2$ and $U^{-1}$ showed that harvesting trout in Summer and Autumn does not make full use o the high utilization of food during those periods; it is suggested that harvesting should occur in October and November.

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82-002084 Hecht, T. INTENSIVE REARING OF *CLARIAS GARIEPINUS* LARVAE (CLARIIDAE: PISCES). *S. Afr. J. Wildl. Res*. 12(3):101-105. 1982. In English with Afrikaans summ. SFA 27(4)
[Dep. Ichthyol. Fish. Sci., Rhodes Univ., Grahamstown 6140, South Africa]
*Clarias gariepinus* larvae were reared intensively at a density of 300 per litre on five experimental diets. The two most suitable diets were plankton and torula yeast and fishmeal and torula yeast, mixed on an equal basis. There was no statistical difference at the 99% confidence level between the growth rates of the larvae fed on these two diets. Methods and techniques are recommended regarding the commercial primary nursing of sharptooth catfish larvae and the cost of primary nursing is discussed. It is further recommended that fry only be stocked into nursery ponds after having attained a total length of 25mm in the hatchery.

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82-002093 Messamer, R. K.; D. O. Terry; P. R. Worst; L. McDonald and G. M. Lindsdau. A MOBILE MECHANICAL FEEDING SYSTEM FOR LARGE LOTS OF FISH. *Proc. Annu. Meet. Colo.-Wyo. Chap. Am. Fish. Soc.* 17:86-90. 1982. Available @$10.00 from Mary McAfee, Colo. Div. Wildl., 711 Independent, Grand Junction, CO 81501. SFA 27(4)
[Wyo. Game Fish Dep., Clark's Fork Hatchery, Powell 82435] A useful and efficient mobile mechanical feeding system, consisting of a hopper and blower arrangement mounted on a four wheel drive all-terrain vehicle, has been utilized for the past eleven years at the Clark's Fork Hatchery in Wyoming. Experience has proven this device to be labor-saving, efficient, and economical. The time required to complete a feeding period is approximately one-third the time required with conventional hand-feeding. The

## FEEDS, FEEDING, AND NUTRITION (CONTINUED)

82-002093 CONTINUED system allows one operator to deliver even amounts of feed to each raceway of fish in a minimum of time. Cost of operation and maintenance is also minimal. Fuel costs average $13.00 per month, and total maintenance costs over an eleven-year period from 1971 to the present were approximately $1,020.00. The average annual cost of this feeding system is $565.00.

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[Div. Fish. Nutr., Natl. Res. Inst. Aquacult., Hiruta, Tamaki, Watarai, Mie 519-04, Japan]

82-002095 Okamoto, M. [STUDIES ON THE COMMUNITY ECOLOGY OF FISHES NEAR THE EXPERIMENTAL FISH NURSERY OF *PAGRUS MAJOR* USING ACOUSTIC CONDITIONING.] *Bull. Jpn. Soc. Sci. Fish.* 48(8):1113-1119. Aug. 1982. In Japanese with English summ. SFA 27(4)
[Jpn. Mar. Sci. Technol. Cent., Natsushima, Yokosuka 237, Japan] Experimental fish nursery of *Pagrus major* using acoustic conditioning had been constructed by Ohita Prefectural Fisheries Experimental Station. Young of *Pagrus major* were conditioned to feed immediately when the sound started in the feeding net cage, then they were released in Yonozu bay. In the bay, they were fed by an automatic feeder (feeding buoy) subsequently. After seven months, the behavioral characters and community ecology of fishes around the feeder were investigated by direct observation and by some automatic recording instruments. As results, some phenomena concerning the behavior of fishes were found as follows. (1) Around the feeder, fifty-seven kinds of fishes were found and the dominants were *Navodon modestus*, *Parapristipoma trilineatum* and *Pagrus major*. (2) In the daytime, *Navodon modestus* aggregated beneath the feeder or near the artifical reefs, and when artificial diet was scattered by the feeder, they clustered beneath the feeder and fed actively. In the nighttime, they rested at the bottom near the artificial reefs. (3) *Parapristipoma trilineatum* aggregated around the rocks near the feeder in the daytime, and fed the diet in the nightime. (4) *Pagrus major* (16-17 cm in total length) came near the feeder only in the daytime and fed at the bottom. (5) It seemed that most of the diet scattered from the feeder was fed on by these three species of fishes, and it was calculated that *Pagrus major* fed on about 20 percent of all diet scattered.

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82-002098 Viola, S. and Y. Arieli. NUTRITION STUDIES WITH A HIGH-PROTEIN PELLET FOR CARP AND *SAROTHERODON* SPP. (TILAPIA). *Bamidgeh* 34(2):39-46. June 1982. SFA 27(4)

## FEEDS, FEEDING, AND NUTRITION (CONTINUED)

82-002098 CONTINUED
[Miloubar Cent. Feedmill, D.N. Ashrat 25207, Israel] High-protein (30%
pellets were compared to standard (25%) pellets, with 8% oil or without it
in a feeding trial with carp in cages. Fishmeal was the only source o
supplemental protein. The high-protein pellets increased growth by 14% o
the average. Oil did not improve growth significantly. High-protein pellet
(30%) were compared to standard pellets (25%) in 3 pond trials with carp a
feeding rates of 2, 3 and 4% of body weight. The high-protein pellet
significantly improved growth and feed conversion by 27% on the average,
except at the lowest feeding rate. Growth responses to feeding rates were
almost proportional. High-protein pellets were compared to standard pellets
in a trial with tilapia in cages at feeding rates of 1.5, 2.25 and 3%. The
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MORPHOLOGY (CONTINUED)

82-002165 CONTINUED fins by 7.0 mm. Ossification had commenced by 5.5 and all bones, except the ethmoid and prevomer, had at least begun to ossif by 21.9 mm. Illustrations of snook larvae, including details of the cauda skeleton, are presented to show changes that occurred during development Limited comparisons with field-caught snook are also presented.

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Eggs were artificially fertilized and incubated in seawater of various salinities and temperatures. Both the ultrastructure of the exceptionally large eggs (average diameter: 2.92 mm) and the embryonic development suggest that the early developmental stages of the halibut are pelagic. Light and electron microscope studies of the halibut eggs showed a thin, homogeneous, lamellated chorion with small pores on the outer surface. However, neutral buoyancy determinations indicated that eggs would float only in salinities greater than c. 37°/oo. The halibut embryo, which develops very slowly, hatches at an apparently premature stage.

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82-002188 Rivas, L. R. CHARACTER DISPLACEMENT AND COEXISTENCE IN T
POECILIID FISHES OF THE GENUS *POECILIA (MOLLIENESIA)* FROM HISPANIOL
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[NMFS, 75 Virginia Beach Dr., Miami, FL 33149] Character displacement
animals, particularly in fishes, is reviewed and the new approach of Gra
(1975) is used in this study to demonstrate character displacement in
*hispaniolana* and *P. dominicensis*, two closely related and partly sympatr
species of mollies endemic to Hispaniola. Background information is giv
on the probable origin, evolution, attainment of present partial sympat
and length of coexistence of the two species, as indicated by their prese
distribution and the paleogeography of Hispaniola. It is hypothesized th
a common ancestor to both species existed on the island prior to the Mioce
about 20 million years ago. It is also hypothesized that the ancestr
population was split during the Miocene-Pliocene for a period of about
million years, that the two species evolved during that time, and that t
barrier to their dispersal was eliminated in late Pliocene about two milli
years ago. It is assumed that during that last period the prese
distribution and partial sympatry were attained, and that the two species

## ORPHOLOGY (CONTINUED)

2-002188 CONTINUED have coexisted twice as long in the localities where haracter displacement shows greater magnitude. Analyses of meristics, orphometrics, and reproduction are given to demonstrate character isplacement in fin ray, scale, and gill-raker number, and in body size and ecundity. Divergent, convergent, and parallel displacement were found to ccur as well as a change of reproductive strategy for *P. dominicensis* in ympatry. Causes and effects of displacement in the two species are iscussed and later summarized in combination with tentative conclusions.

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[Biol. Fac., Moscow Univ., USSR] An ecological and morphological analys
of the embryonic, larval and fingerling periods of development of t
minnow, *Phoxinus phoxinus*, was carried out. The eggs are mesoplasmic, t
mean diameter of mature oocytes is 1.13 mm. The embryonic period, includi
9 stanzas, continued for about 11 days at a water temperature of 15-16
hatching of the prolarvae occurs at an age of 4 days. The larval period
development includes 5 stanzas with a duration of about 1.5 months.
reaching a length of 17-20 mm the young passes into the fingerling period
development. Data are presented and discussed on the ecology of the you
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etc. The spawning livery of the minnow is described and the spawning tim
given.

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[Lab. Comp. Biochem., San Diego, CA 92109] As part of a survey of the red cell hematology of birds, reptiles and fishes, two dogfish sharks, the spiny, *Squalus acanthias* (suborder *Squaloidei*) and the smooth, *Mustelus canis* (suborder *Galeoidei*), have been selected from the elasmobranch fishes for a detailed study. Investigations were carried out on embryos, new born, young and adults at the Marine Biological Laboratory, Woods Hole, Mass. Studies on the changes of the red cell during early development of the two sharks, which have different modes of reproduction, the spiny ovoviviparous and the smooth viviparous, were facilitated by the ready availability of embryos of convenient size for sampling of blood and testing of the red cells. Phosphate components of the red cells were isolated by ion-exchange column chromatography and the turnover rates of the nucleotides measured by their incorporation of radioactivity after brief incubation with $^{32}$P-labelled inorganic phosphate. Of special interest to a comparison of the two dogfishes is the concentration of red cell guanosine triphosphate which is high in the smooth and low in the spiny.

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Behaviorial and physiological measurements were made during the winter at low temperatures to evaluate cold temperature dormancy in the brown bullhead. At 17°C and when slowly cooled to 3°C the bullheads often buried themselves in the mud. Animals buried at 3°C were not immobilized and would emerge

PHYSIOLOGY (CONTINUED)

82-002243 CONTINUED from the mud following a disturbance. No readjustment of the thermoregulatory mechanisms was seen when acclimatized bullheads were placed in a thermal gradient that was slowly cooled. At the end of 6-7 h, the bullheads always became quiescent in the warmest portion of the gradient available (11-13°C). Spontaneous activity and oxygen uptake were measured, at the acclimation temperature, for animals acclimated to 3-17°C at 2°C intervals. Spontaneous activity in an annular tank showed a high degree of compensation between 5 and 17°C. At 3°C the bullheads showed much less spontaneous activity and an exceptionally low initial hyperactive period following placement in the tank. When oxygen uptake was measured with a closed system technique which involved a very slight disturbance, large increases in magnitude and variability of oxygen uptake occurred at higher acclimation temperatures. These large increases were not seen if oxygen uptake of sleeping fish was measured with an open system. Overwintering in this species may simply involve an increase in the time spent burrowed in the mud asleep.

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*anthurus* Lacépède, $^{14}$C labeled food was rapidly digested and assimilated
ith up to 20% respired as $^{14}CO_2$ within 10 h from ingestion. Two indices of
arbon assimilation, total carbon utilization (range 9.4 to 64.7%) and
otal carbon absorption (range 67.2 to 99.2%) were calculated from the
mount of $^{14}$C ingested, retained, and defecated. Carbon utilization and
bsorption were not significantly ($P>0.10$) related to development as
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Similarities in phenotypic characters (isozyme gene frequencies, life history, and morphology) among 35 stocks of coho salmon, *Oncorhynchus kisutch*, from Oregon, Washington, and California were compared by using agglomerative and divisive cluster analyses. Coho salmon stocks from similar environments were phenotypically similar. Five groups of stocks were identified by the agglomerative cluster analysis: 1) wild stocks from the northern Oregon coast, 2) wild stocks from the southern Oregon coast, 3) stocks from hatcheries that used wild coho salmon for an egg and sperm source, 4) stocks from large stream systems, and 5) hatchery stocks from the northern Oregon coast. Three trends were indicated by the clustering patterns: 1) stocks that were geographically close tended to be phenotypically similar, 2) stocks from large stream systems were more similar to each other than to stocks from smaller stream systems, independent of geographic proximity, and 3) hatchery stocks were more similar to each other than to wild stocks, and wild stocks were more similar to each other than to hatchery selecting donor stocks from hatcheries for transplanting to stream

## GENETICS, VARIATION STUDIES AND HYBRIDIZATION (CONTINUED)

82-002381 CONTINUED systems or transferring to other hatcheries. Individual phenotypic characters were correlated with characters of the stream systems. Results of two agglomerative cluster analyses, one of certain characters of the stocks and one of certain characters of the stream systems, demonstrated a lack of correspondence between stream types and stock phenotypes between stream types and stock phenotypes.

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[Dep. Anim. Genet. Breeding, Agric. Univ. Norway, 1432 Aas-NLH, Norway] Experiments were carried out to determine whether it was possible to produce all female diploid gynogenetic coho salmon (*Oncorhynchus kisutch*). Experimental groups were cold shocked at -0.5°C for 4h in brackish water (15°/oo). The effect of varying egg and milt temperature before insemination and cold shock was investigated as was the effect of elapsed time for mixing of gametes to application of cold shock. Eggs were collected from females with and without hormonally induced ovulation. Irradiated sperm from another species (*O. tshawytscha*) was tested for its ability to induce gynogenesis in coho eggs. Cold shocking resulted in diploid gynogenetic all female coho when eggs were inseminated with irradiated sperm. Hatching success was affected by the use of eggs derived form either normal or induced ovulation and also by the interval between egg-activation and cold shocking. The diploid gynogenetic fish had a slower growth rate and higher mortality than the controls up to 230 days post-hatching. Gynogenesis by irradiated chinook sperm failed. However, the control crosses with normal chinook sperm yielded hybrids that exhibited good hatchability and a growth rate five times higher than in coho salmon.

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82-002395 CONTINUED season in September to October in 1972 and 1976. In 1972 sections ranged in surface area from 21 to 122$m^2$ and had volumes of 5.0-17.3$m^3$ and when surveyed in 1976 surface areas were 15-106 $m^2$ and volumes 2.1-6.7$m^3$. In 1976 widths and areas of sections were 63-87% of the values for 1972, depths were 39-68% and volumes 28-52% of the earlier values. These differences were due to 1976 being drier and warmer. In both years, all sections contained 0+ and 1+ age classes of salmon and trout and some sections contained 2+ age salmon and trout. The total density of fish in a section ranged from 1.9 to 3.9$m^{-2}$ in 1972 and from 3.72 to 6.08$m^{-2}$ in 1976. There was an inverse relationship, significant in 1972 only, between the density of 0+ salmon and that of 1+ trout in the different sections. Densities of both 0+ and 1+ salmon in the sections were inversely correlated, and those of 0+ and 1+ trout were directly correlated, with area of water deeper than 10cm.

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[Parmly Hear. Inst., Loyola Univ. Chicago, 6525 N. Sheridan Rd., Chicago, IL 60626]

82-002397 Finger, T. R. INTERACTIVE SEGREGATION AMONG THREE SPECIES OF SCULPINS (*COTTUS*). *Copeia* 1982(3):680-694. 10 Aug. 1982. SFA 27(4)
[Sch. For. Fish. Wildl., 112 Stephens Hall, Univ. Mo., Columbia 65211]

82-002398 Gibson, R. N. THE EFFECT OF HYDROSTATIC PRESSURE CYCLES ON THE ACTIVITY OF YOUNG PLAICE *PLEURONECTES PLATESSA*. *J. Mar. Biol. Assoc. U.K.* 62(3):621-635. Aug. 1982. SFA 27(4)
[Scott. Mar. Biol. Assoc., Dunstaffnage Mar. Res. Lab., P.O. Box 3, Oban, Argyll, Scotland PA34 4AD] Young plaice of 5-8 cm in length were subjected to sinusoidal hydrostatic pressure cycles varying in amplitude and period from 0.16 to 1.5 m and 2 to 12.6 h. The response to the pressure cycle was assessed by $\chi^2$ periodogram analysis of the changes in locomotory activity throughout the cycle. A low response rate was recorded, but some fish responded to pressure changes of 0.25-1.5 m amplitude. The amplitude of the pressure change was found to be more important than the rate in eliciting the response.

82-002399 Heller, J. AGGRESSION COLOUR PATTERN OF *ASTATOTILAPIA FLAVIIJOSEPHI* (TELEOSTEI: CICHLIDAE) IN THE AQUARIUM. *Isr. J. Zool.* 30(1-2):88-91. 1981. SFA 27(4)
[Dep. Zool., Hebrew Univ. Jerusalem, Jerusalem 91904, Israel]

82-002400 Johnson, J. H. and E. Z. Johnson. OBSERVATIONS ON THE EYE-PICKING BEHAVIOR OF THE CUTLIPS MINNOW, *EXOGLOSSUM MAXILLINGUA*. *Copeia* 1982(3):711-712. 10 Aug. 1982. SFA 27(4)
[N.Y. Dep. Environ. Conserv., 50 Wolf Rd., Albany 12233]

82-002401 Johnson, W. S. and V. C. Chase. A RECORD OF CLEANING SYMBIOSIS INVOLVING *GOBIOSOMA* SP. AND A LARGE CARIBBEAN OCTOPUS. *Copeia* 1982(3):712-714. 10 Aug. 1982. SFA 27(4)
[Dep. Biol. Sci., Goucher Coll., Towson, MD 21204]

82-002402 Klimov, V. I. and G. I. Ogurtsov. PECULIARITIES OF BEHAVIOR IN HATCHERY PRODUCED CARP LARVAE, *CYPRINUS CARPIO*. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 21(4):147-149. 1981. SFA 27(4)
[VNIIPRKh, Rybnoye, USSR]

BEHAVIOR (CONTINUED)

82-002403 Kruchinin, O. N.; Y. A. Kuznetsov and M. A. Sorokin. THE DIURNAL RHYTHM IN THE ACTIVITY OF SOME FAR EASTERN SPECIES OF FISH. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 21(1):127-134. 1981. SFA 27(4)
[TINRO, Vladivostock, USSR]

82-002404 Loekle, D. M.; D. M. Madison and J. J. Christian. TIME DEPENDENCY AND KIN RECOGNITION OF CANNIBALISTIC BEHAVIOR AMONG POECILIID FISHES. *Behav. Neural Biol.* 35(3):315-318. July 1982. SFA 27(4)
[Dep. Biol. Sci., State Univ. N.Y., Binghamton 13901]

82-002405 Mackie, A. M. and A. I. Mitchell. FURTHER STUDIES ON THE CHEMICAL CONTROL OF FEEDING BEHAVIOUR IN THE DOVER SOLE, *SOLEA SOLEA*. *Comp. Biochem. Physiol. A Comp. Physiol.* 73(1):89-93. 1982. SFA 27(4)
[Nat. Environ. Res. Counc., Inst. Mar. Biochem., Aberdeen AB1 3RA, Scotland] The feeding stimulant requirement of the Dover sole was very specific, only betaine and dimethylthetin being effective. Substances tasting bitter to the human tongue acted as feeding deterrents for the sole. Of the other feeding deterrents identified, anthraquinone pigments, azo dyes and saponins were the most potent. The results are discussed in the context of both aquaculture and chemical ecology.

82-002406 Malyukina, G. A. and V. I. Martem'yanov. AN ELECTROCARDIOGRAPHIC STUDY OF CHEMICAL SENSITIVITY IN SOME FRESHWATER FISHES. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 21(3):77-84. 1981. SFA 27(4)
[Biol. Fac., Moscow Univ., USSR]

82-002407 Minami, T. [THE EARLY LIFE HISTORY OF A TONGUE FISH *PARAPLAGUSIA JAPONICA*.] *Bull. Jpn. Soc. Sci. Fish.* 48(8):1041-1046. Aug. 1982. In Japanese with English summ. SFA 27(4)
[Dep. Fish., Fac. Agric., Kyoto Univ., Kyoto 606, Japan]

82-002408 Mizuno, N.; M. Mukai; A. Goto and K. Hamada. [STUDIES ON THE FRESHWATER FISH IN HOKKAIDO, JAPAN-II. DISTRIBUTION OF TWO TYPES OF A GOBY, *RHINOGOBIUS BRUNNEUS*.] *Bull. Fac. Fish. Hokkadio Univ.* 33(3):115-125. Sept. 1982. In Japanese with English summ. SFA 27(4)
[Lab. Embryol. Genet., Fac. Fish., Hokkaido Univ., Hakodate, Japan]

82-002409 Nashimoto, K.; K. Ishii; S. Sasaki and T. Meguro. [THE SWIMMING SPEED OF TUNAS IN RELATION TO TAIL BEAT FREQUENCY.] *Bull. Jpn. Soc. Sci. Fish.* 48(7):933-939. July 1982. In Japanese with English summ. SFA 27(4)
[Fac. Fish., Hokkaido Univ., Minato, Hokodate 041, Japan]

82-002410 Neil, S. J. THE AGONISTIC BEHAVIOR OF *CICHLASOMA MEEKI* (PISCES: CICHLIDAE): A TEST OF GAME THEORETIC PREDICTIONS. *Ph.D. dissertation, Univ. Minn.* 156p. 1982. From Diss. Abstr. Int. B Sci. Eng. 43(1):36. July 1982. SFA 27(4)

82-002411 Reynolds, W. W.; M. E. Casterlin and D. G. Lindquist. THERMAL PREFERENDA AND DIEL ACTIVITY PATTERNS OF FISHES FROM LAKE WACCAMAW. *Brimleyana* No. 7. p. 55-60. July 1982. SFA 27(4)
[D. G. Lindquist: Dep. Biol., Univ. N.C., Wilmington, NC 28406] We tested seven fish species from Lake Waccamaw in Ichthyotron electronic shuttleboxes to determine their preferred temperatures and diel activity patterns. All preferred temperatures between 25° and 31°C, which corresponded to water temperatures measured in the lake in August 1981. All species avoided temperatures below 20° or above 36°C. One species was diurnal, two were

## BEHAVIOR (CONTINUED)

82-002411 CONTINUED nocturnal, and four were crepuscular in diel activity pattern under the LD 14:10 August photoperiod.

82-002412 Saglio, P.; M. Le Martret. COMMUNICATION INTRASPÉCIFIQUE D'ORIGINE PHÉROMONALE CHEZ E CARASSIN DORÉ IMMATURE (*CARASSIUS AURATUS* L.). II. ETUDE EN OLFACTOMÈTRE DE L'ACTIVITÉ COMPORTEMENTALE D'EXTRAITS D'ORIGINE EPIDERMIQUE. [THE ROLE OF PHEROMONES IN INTRASPECIFIC COMMUNICATION IN IMMATURE GOLDFISH, *CARASSIUS AURATUS* L. II. OLFACTOMETRIC STUDY OF THE BEHAVIORAL ACTIVITY OF EPIDERMIC EXTRACTS.] *Biol. Behav.* 7(3):221-234. 1982. In French with English summ. SFA 27(4)
[Lab. Ecol. Poissons Amenage. Peches, I.N.R.A., B.P. N°3, Saint-Pee-sur-Nivelle, F 64310 Ascain, France]

82-002413 Savchenko, N. V.; A. G. Gusar and V. A. Getmantsev. THE LOCOMOTOR ACTIVITY OF FISHES IN LOW ILLUMINATION. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 21(1):171-175. 1981. SFA 27(4)
[VNIRO, Moscow, USSR]

82-002414 Sbikin, Y. N. THE OPTOMOTOR REACTION AND SOME CHARACTERISTICS OF THE VISION OF YOUNG STURGEON. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 21(1):167-171. 1981. SFA 27(4)
[IEMEZh, USSR Acad. Sci., Moscow, USSR]

82-002415 Scott, J. S. SELECTION OF BOTTOM TYPE BY GROUNDFISHES OF THE SCOTIAN SHELF. *Can. J. Fish. Aquatic Sci.* 39(7):943-947. July 1982. In English with French summ. SFA 27(4)
[Mar. Fish Div., Dep. Fish. Oceans, Biol. Stn., St. Andrews, NB E0G 2X0, Canada]

82-002416 Smith, J. W. and J. V. Merriner. ASSOCIATION OF COBIA, *RACHYCENTRON CANADUM*, WITH COWNOSE RAY, *RHINOPTERA BONASUS*. *Estuaries* 5(3):240-242. Sept. 1982. SFA 27(4)
[S.C. Wildl. Mar. Resour. Dep., P.O. Box 12559, Charleston 29412]

82-002417 Squire, J. L., Jr. CATCH TEMPERATURES OF SOME IMPORTANT MARINE SPECIES OFF CALIFORNIA. *NOAA Tech. Rep. NMFS SSRF* 759. iii + 17p. Aug. 1982. SFA 27(4)
[NMFS, P.O. Box 271, La Jolla, CA 92038]

82-002418 Uematsu, K. and K. Yamamori. BODY VIBRATION AS A TIMING CUE FOR SPAWNING IN CHUM SALMON. *Comp. Biochem. Physiol. A Comp. Physiol.* 72(3):591-594. 1982. SFA 27(4)
[Fac. Appl. Biol. Sci., Hiroshima Univ., Fukuyama, Hiroshima 720, Japan]
Trunk muscular EMG in both sexes of spawning chum salmon were recorded simulataneously with the aid of a telemetry system in order to determine the sex which initiates spawning. The trunk muscular activities for spawning in both sexes consisted of two stages i.e. an initial weak and a final strong burst. During the final stage, oviposition and sperm ejaculation occurred. The initial stage in the female began prior to that in the male, while the final stage in the male occurred before the female's. The possible significance of the amplitude change in the spawning convulsion as a signal for synchronizing the spawning of both sexes, was discussed.

## BEHAVIOR (CONTINUED)

82-002419 Zerbolio, D. J., Jr. and J. L. Royalty. ACQUISITION AND EXTINCTION OF DIFFERENTIAL RESPONSES TO SIGNALS PAIRED WITH SHOCK OR SHOCK OMISSION IN GOLDFISH: EVIDENCE FOR TRULY DISCRIMINATED AVOIDANCE LEARNING. *Anim. Learn. Behav.* 10(3):377-389. Aug. 1982. SFA 27(4)
[Dep. Psychol., Univ. Mo., St. Louis 63121]

## LIFE HISTORY-GENERAL WORKS

82-002420 Burr, B. M. and L. M. Page. THE LIFE HISTORY OF THE LEAST DARTER, *ETHEOSTOMA MICROPERCA*, IN THE IROQUOIS RIVER, ILLINOIS. *Ill. Nat. Hist. Surv. Biol. Notes* No. 112. 15p. Aug. 1979. SFA 27(4)
[Ill. Nat. Hist. Surv., Urbana]

82-002421 Craig, D. and G. J. FitzGerald. REPRODUCTIVE TACTICS OF FOUR SYMPATRIC STICKLEBACKS (GASTEROSTEIDAE). *Environ. Biol. Fishes* 7(4):369-375. 15 Sept. 1982. SFA 27(4)
[Dep. Biol., Fac. Sci. Génie, Univ. Laval, PQ G1K 7P4, Canada]

82-002422 Devadoss, P.; P. K. M. Pillai; P. Natarajan and K. Muniyandi. OBSERVATIONS ON SOME ASPECTS OF THE BIOLOGY AND FISHERY OF *PSETTODES ERUMEI* (BLOCH) AT PORTO NOVO. *Indian J. Fish.* 24(1-2):62-68. 1977. SFA 27(4)

*Psettodes erumei* is a carnivorous fish subsisting mainly on fishes (81.73%). Crustaceans (11.93%) and molluscs (6.34%) are also found in the stomach. The spawning season is observed to be a prolonged one extending over a period of nearly 7 months from November to May as against the short and restricted spawning of this species in west coast of India. The fishery is a minor one, estimated to contribute about 8.6 metric tons annually, forming 0.58% of the total marine fish catches in Porto Novo during 1971-1973. Seasonal abundance and fluctuations in the catches are also dealt with.

82-002423 Frederick, L. L. ECOLOGY OF JUVENILE WHITEFISH (*COREGONUS CLUPEAFORMIS*) IN LAKE MICHIGAN, EAST OF DOOR COUNTY, WISCONSIN. *Ph.D. dissertation, Univ. Wis.* 115p. 1982. From Diss. Abstr. Int. B Sci. Eng. 43(4):981. Oct. 1982. SFA 27(4)

The lake whitefish (*Coregonus clupeaformis*) is the major commercial species in Lake Michigan but little is known about its life history until it appears in the commercial catch at Age III. This study investigated larval and young-of-the-year life history parameters of lake whitefish from April, 1974, through October, 1976. Lake whitefish eggs were spawned in November and hatched the following April at ice out. Larvae were found in a series of shallow, protected bays along the Door County shore of Lake Michigan until mid-May. By early August, young-of-the-year whitefish had grown to 120 mm total length and were established as members of the benthic community in 10-30 m of water outside the bays. Their diet shifted from rotifers to larger zooplankton, and finally chironomids and *Pontoporeia*. A concurrent gill netting program assessed other fish species from the area occupied by juvenile whitefish to determine the potential for predation and competition. Population estimates indicate that whitefish year class strength is determined sometime between hatching and recruitment to the fishery at Age III. The 1975 larval catch was significantly smaller than the 1974 and 1976 larval catches. By August, there was no significant difference in young-of-the-year catch among years, and by Age III, the 1975 year class stood out as significantly larger. In 1975, larval whitefish in nursery bays were distributed independently of each other in 50 percent of the samples. In 1974 and 1976 larval whitefish were distributed in clusters. The tendency of larvae to cluster within the nursery area could affect their ability to attack sufficient quantities of food, particularly if both larval

## LIFE HISTORY-GENERAL WORKS (CONTINUED)

82-002423 CONTINUED and plankton distributions are influenced by storm surges and seiches. Patchiness of distribution could also influence the opportunity for interaction with predators.

82-002424 Hindar, K. and B. Jonsson. HABITAT AND FOOD SEGREGATION OF DWARF AND NORMAL ARCTIC CHARR (*SALVELINUS ALPINUS*) FROM VANGSVATNET LAKE, WESTERN NORWAY. *Can. J. Fish. Aquatic Sci.* 39(7):1030-1045. July 1982. In English with French summ. SFA 27(4)
[Zool. Inst., Univ. Oslo, P.O. Box 1050 Blindern, Oslo 3, Norway]

82-002425 Hussain, N. A. and M. A. S. Abdullah. THE LENGTH-WEIGHT RELATIONSHIP, SPAWNING SEASON AND FOOD HABITS OF SIX COMMERCIAL FISHES IN KUWAITI WATERS. *Indian J. Fish.* 24(1-2):181-194. 1977. SFA 27(4)

82-002426 Kwain, W. SPAWNING BEHAVIOR AND EARLY LIFE HISTORY OF PINK SALMON (*ONCORHYNCHUS GORBUSCHA*) IN THE GREAT LAKES. *Can. J. Fish. Aquatic Sci.* 39(10):1353-1360. Oct. 1982. In English with French summ. SFA 27(4)
[Lake Superior Fish. Res. Unit, Fish. Br., Ontario Minist. Nat. Resour., Sault Ste. Marie, ON P6A 2B3, Canada]

82-002427 Magnan, P. and G. J. FitzGerald. RESOURCE PARTITIONING BETWEEN BROOK TROUT (*SALVELINUS FONTINALIS* MITCHELL) AND CREEK CHUB (*SEMOTILUS ATROMACULATUS* MITCHELL) IN SELECTED OLIGOTROPHIC LAKES OF SOUTHERN QUEBEC. *Can. J. Zool.* 60(7):1612-1617. July 1982. In English with French summ. SFA 27(4)
[Dep. Biol., Univ. Laval, PQ G1K 7P4, Canada] The spatial distribution, food habits, and growth of an allopatric brook trout (*Salvelinus fontinalis*) population was compared with a trout population coexisting with creek chub (*Semotilus atromaculatus*). Sympatric trout differed in spatial distribution and food habits from allopatric trout suggesting a niche shift of the trout when they live with creek chub. Also, although there is a certain overlap in diet and spatial distribution, sympatric populations of the two species differed on these resource axes. However, growth of sympatric trout is not clearly related to the presence or absence of the creek chub, suggesting that factors other than interspecific competition may affect growth in the seven study lakes.

82-002428 Manooch, C. S. III and C. A. Barans. DISTRIBUTION, ABUNDANCE, AND AGE AND GROWTH OF THE TOMTATE, *HAEMULON AUROLINEATUM*, ALONG THE SOUTHEASTERN UNITED STATES COAST. *NOAA Fish. Bull.* 80(1):1-19. Jan. 1982. SFA 27(4)
[NMFS, Beaufort, NC 28516] Tomtates, *Haemulon aurolineatum*, were widely distributed over sponge-coral habitats throughout the South Atlantic Bight region in depths of 9 to 55 m, although they were occasionally caught in large numbers over sandy bottom habitats. Fish were most common in offshore areas during winter and not taken in water of <10°C south of Cape Fear, N.J. Juveniles (≤148 mm TL) were caught in the same geographical areas as adults, but were collected in warmer waters than adults during fall and winter. Spawning occurred during the spring. Individuals collected by hook and line and trawl were aged by scales and otoliths. Back-calculated mean total lengths were from 103.0 mm at age I, to 280.5 at age IX. The von Bertalanffy growth equation is $l_t=310(1-\exp-0.22017(t+1.28))$, where $t$ is age in years, and $l_t$ is total length at age. The oldest fish sampled was age IX,289 mm TL. Annual total mortality based on catch curves from 1,496 fish landed by the recreational fishery from 1972 to

## LIFE HISTORY-GENERAL WORKS (CONTINUED)

82-002428 CONTINUED 1978 was 59% (instantaneous total annual mortality = 0.89). We found that the tomtate grows faster, does not live as long, and has a higher natural mortality rate than most other reef fishes previously studied in the South Atlantic Bight.

82-002429 Markle, D. F.; D. A. Methven and L. J. Coates-Markle. ASPECTS OF SPATIAL AND TEMPORAL COOCCURRENCE IN THE LIFE HISTORY STAGES OF THE SIBLING HAKES, *UROPHYCIS CHUSS* (WALBAUM 1792) AND *UROPHYCIS TENUIS* (MITCHILL 1815) (PISCES: GADIDAE). *Can. J. Zool.* 60(9):2057-2078. Sept. 1982. In English with French summ. SFA 27(4)
[Huntsman Mar. Lab., St. Andrews, NB E0G 2X0, Canada] The amount of coexistence in the sympatric sibling species, *Urophycis chuss* and *U. tenuis*, appears to be a function of ontogeny, with each life history stage showing different probabilities of interspecific encounters. Demersal juveniles coexist the least since *U. chuss* is inquiline with scallops and *U. tenuis* is in nearshore shallows. In *U. tenuis* there is also intraspecific segregation, with older juveniles and young adults bathymetrically segregated from the youngest demersal juveniles in summer. Relatively more coexistence is seen between neustonic juveniles. However, they show some seasonal and pronounced diel differences in availabilty to neuston nets (*U. chuss* predominates during the day and *U. tenuis* during night). The greatest coexistence is seen between adult *U. chuss* and adolescent to adult *U. tenuis*. Over its life, *U. tenuis* tends to move into deeper water while *U. chuss* is relatively stenotopic, its distribution largely a reaction to temperature. This life history strategy of *U. tenuis* is "get big quick", a goal achieved, in part, through delayed maturation (relative to *U. chusss*). The strategy of *U. chuss* seems to be avoid predation, concentrate growth in the juvenile stage, and "get mature quick." We speculate that both species' life histories may be subordinate to getting the demersal juveniles into the right nursery area at the right time.

82-002430 Morin, R.; J. J. Dodson and G. Power. LIFE HISTORY VARIATIONS OF ANADROMOUS CISCO (*COREGONUS ARTEDII*), LAKE WHITEFISH (*C. CLUPEAFORMIS*), AND ROUND WHITEFISH (*PROSOPIUM CYLINDRACEUM*) POPULATIONS OF EASTERN JAMES-HUDSON BAY. *Can. J. Fish. Aquatic Sci.* 39(7):958-967. July 1982. In English with French summ. SFA 27(4)
[J. J. Dodson: GIROQ, Dep. Biol., Univ. Laval, Quebec City, PQ G1K 7P4, Canada]

82-002431 Nash, R. D. M. THE BIOLOGY OF FRIES' GOBY, *LESUEURIGOBIU FRIESII* (MALM), IN THE FIRTH OF CLYDE, SCOTLAND, AND A COMPARISON WITH OTHE STOCKS. *J. Fish Biol.* 21(1):69-85. July 1982. SFA 27(4)
[Inst. Marinbiol. Liminol., Univ. Oslo, Postboks 1064, Blindern, Oslo 3, Norway] The general biology of a population of *Lesueurigobius friesii* in th Firth of Clyde, Scotland, was studied between October 1977 and Decembe 1979. In this population the fish attained 95 mm and lived a maximum of ni years. The population growth characteristics from von Bertalanffy grow curves showed that the Clyde stock of *L. friesii* attained a greater maxim theoretical length ($L_\infty$) than stocks in the Lynn of Lorne or Biscay and had lower growth coeffcient (*K*). In all three stocks, the majority of the grow in length ($A_{0.95}$) was achieved by the end of the fourth year of life. I general the sex ratio was 1:1 throughout the season. Spawning occurred fr May to August, approximately the same time as the Lynn of Lorne stock Sexual maturity was first reached at a smaller size in males than females The abundance of *L. friesii* in the Clyde fluctuated considerably wi reduced numbers of fish caught just after spawning.

LIFE HISTORY-GENERAL WORKS (CONTINUED)

82-002432 Nigro, A. A. and J. J. Ney. REPRODUCTION AND EARLY-LIFE ACCOMMODATIONS OF LANDLOCKED ALEWIVES TO A SOUTHERN RANGE EXTENSION. *Trans. Am. Fish. Soc.* 111(5):559-569. Sept. 1982. SFA 27(4)
[U.S. FWS, Natl. Fish. Res. Cent., Grand Coulee, WA 99163]

82-002433 Page, L. M. and R. L. Mayden. THE LIFE HISTORY OF THE TENNESSEE SNUBNOSE DARTER, *ETHEOSTOMA SIMOTERUM* IN BRUSH CREEK, TENNESSEE. *Ill. Nat. Hist. Surv. Biol. Notes* No. 117. 11p. Aug. 1981. SFA 27(4)
[Ill. Nat. Hist. Surv., Urbana]

82-002434 Page, L. M. THE LIFE HISTORIES OF *ETHEOSTOMA OLIVACEUM* AND *ETHEOSTOMA STRIATULUM*, TWO SPECIES OF DARTERS IN CENTRAL TENNESSEE. *Ill. Nat. Hist. Surv. Biol. Notes* No. 113. 14p. Aug. 1980. SFA 27(4)
[Ill. Nat. Hist. Surv., Urbana]

82-002435 Paine, M. D.; J. J. Dodson and G. Power. HABITAT AND FOOD RESOURCE PARTITIONING AMONG FOUR SPECIES OF DARTERS (PERCIDAE: *ETHEOSTOMA*) IN A SOUTHERN ONTARIO STREAM. *Can. J. Zool.* 60(7):1635-1641. July 1982. In English with French summ. SFA 27(4)
[G. Power: Dep. Biol., Univ. Waterloo, Waterloo, ON N2L 3G1, Canada] Resource partitioning among four species of darters (Percidae: *Etheostoma*) in an Ontario stream was investigated by determining diet and relative abundance in two habitats. The four species partitioned both food and habitat resources. *E. caeruleum* and *E. flabellare* dominated the riffles; the former took prey from rock surfaces, the latter took prey from between and beneath rocks. *Etheostoma microperca* and *E. nigrum* dominated the weed beds; the former feeding on prey on and around plants, the latter feeding on benthic prey. Diets were closely related to morphology, but habitat utilization was not. Determining the importance of habitat versus food partitioning is difficult, because microhabitat and foraging habitat may be nearly identical.

82-002436 Peterson, N. P. POPULATION CHARACTERISTICS OF JUVENILE COHO SALMON (*ONCORHYNCHUS KISUTCH*) OVERWINTERING IN RIVERINE PONDS. *Can. J. Fish. Aquatic Sci.* 39(9):1303-1307. Sept. 1982. In English with French summ. SFA 27(4)
[Wash. State Dep. Fish., Forks 98331]

82-002437 Pollock, B. R. SPAWNING PERIOD AND GROWTH OF YELLOWFIN BREAM, *ACANTHOPAGRUS AUSTRALIS* (GÜNTHER), IN MORETON BAY, AUSTRALIA. *J. Fish Biol.* 21(3):349-355. Sept. 1982. SFA 27(4)
[Fish. Res. Br., Dep. Primary Indus., Transport House, Fortitude Valley, Queensland, Australia] Monthly changes in the gonosomatic index indicate that yellowfin bream, *Acanthopagrus australis*, in Moreton Bay have a short spawning season with a peak during the period July to August each year. The growth rate of *A. australis* was estimated from tag-recapture data and by length-frequency analysis. Modes representing age classes 0, I and II often appeared in length-frequency distributions, however modes for older age classes were difficult to identify. The von Bertalanffy growth curve parameters calculated from release-recapture data are: $L_\infty$ = 29.5cm; K=0.51; $t_0$=-0.32 years.

2-002438 Pratt, H. L., Jr. and R. B. Conklin. OBSERVATIONS ON LARGE WHITE SHARKS, *CARCHARODON CARCHARIAS*, OFF LONG ISLAND, NEW YORK. *NOAA Fish. Bull.* 0(1):153-156. Jan. 1982. SFA 27(4)
[NMFS, Narragansett, RI 02992]

## LIFE HISTORY-GENERAL WORKS (CONTINUED)

**82-002439** Ramanathan, N.; P. Vijaya; V. Ramaiyan and R. Natarajan. ON T BIOLOGY OF THE LARGE-SCALED TONGUE SOLE *CYNOGLOSSUS MACROLEPIDOT* (BLEEKER). *Indian J. Fish.* 24(1-2):83-89. 1977. SFA 27(4)
The biometry of *C. macrolepidotus* using the regression equation $y$ = a+ has been studied; the regression lines based on the angle of the tange show that total length has the fastest growth and the eye diameter th slowest. The food of *C. macrolepidotus* consists of crustaceans, bivalve polychaetes, fish larvae, phytoplankton and algal matter, of which th crustaceans appear to be highly favoured. Ova-diameter measurements sho that spawning takes place from August to October (Pre-monsoon period). Th fecundity of the fish, which increases with its size, shows a range o 25,663 to 317,577. The size of the female at first maturity is 191 mm.

**82-002440** Randall, R. G. EMERGENCE, POPULATION DENSITIES, AND GROWTH O SALMON AND TROUT FRY IN TWO NEW BRUNSWICK STREAMS. *Can. J. Zool* 60(10):2239-2244. Oct. 1982. In English with French summ. SFA 27(4)
[Fish. Res. Br., Gulf Reg., P.O. Box 5030, Moncton, NB E1C 9B6, Canada Postemergent downstream dispersal of Atlantic salmon fry (*Salmo salar*) wa monitored using drift samplers during spring 1978 in two Miramichi River N.B., tributaries. Catch rates of salmon fry peaked during the 2nd and 3r weeks of June in both streams, coinciding with peak emergence of the salmo from the gravel. Very few trout fry (*Salvelinus fontinalis*) were captured i the drift nets, but electrofishing results indicated trout emergenc preceded salmon by about 3 weeks. The earlier emergence of the trout gav them an early growth advantage over the salmon, so that trout fry wer usually larger than salmon fry inhabiting the same stream areas. Earl growth rates of both salmon and trout were quite varied among four strea sites during 2 years when growth was monitored; growth differences were discussed in relation to stream temperatures and density-dependent growth. Salmon fry were more abundant than trout fry at most sites in both years.

**82-002441** Rohde, F. C. and R. G. Arndt. LIFE HISTORY OF A COASTAL PLAI POPULATION OF THE MOTTLED SCULPIN, *COTTUS BAIRDI* (OSTEICHTHYES: COTTIDAE), IN DELAWARE. *Brimleyana* No. 7. p. 69-94. July 1982. SFA 27(4)
[Chas. T. Main, Inc., Prudential Cent., Boston, MA 02199] Aspects of the biology of a Coastal Plain population of *Cottus bairdi* in a lowland forest stream in Delaware were examined during 1973-81. *Cottus bairdi* occur primarily over a gravel substrate; naturally-occurring rocks are absent. Individuals are shorter-lived and attain sexual maturity at a smaller size than in other studied populations. Two age groups, and a presumed third, were found. Only 33% of age group 0 survives to spawn in age group I. Spawning occurs in February and March at a water temperature of 6.6° t 12.5° C, and mean ovum diameter is 2.15 mm. There is a strong relationshi between ova number and standard length (Y = -157.11 + 6.60 SL). Fecundity i lower than that reported for most populations of *C. bairdi*. Most eggs ar deposited in single-spawn clusters, with a mean egg number of 134.2 pe cluster. Condition factor indicates that males are generally more robust than females. Most growth in length occurs in age group 0, males are longer than females, and there is a highly significant difference in sex ratio of mature specimens taken. Dominant food is trichopteran and dipteran larvae, and plecopteran nymphs; crustaceans, ephemeropteran nymphs, and coleoptera larvae are of minor importance. There is seasonal variation in food items. Diet differs only slightly as a function of sculpin size.

**82-002442** Rozenvasser, Y. M. and Y. V. Mikodina. CHARACTERISTICS OF T LONG-FINNED MULLET, *MUGIL AURATUS*, OVERWINTERING IN THE BLACK SEA A MIGRATING IN SPRING INTO THE SEA OF AZOV. *J. Ichthyol. (Engl. Transl. Vop Ikhtiol.)* 21(1):156-160. 1981. SFA 27(4)
[VNIRO, Moscow, USSR]

## LIFE HISTORY-GENERAL WORKS (CONTINUED)

82-002443 Samaritan, J. M. and R. E. Schmidt. ASPECTS OF THE LIFE HISTORY OF A FRESHWATER POPULATION OF THE MUMMICHOG, *FUNDULUS HETEROCLITUS* (PISCES: CYPRINODONTIDAE), IN THE BRONX RIVER, NEW YORK, U.S.A. *Hydrobiologia* 94(2):149-154. 3 Sept. 1982. SFA 27(4)
[Fordham Univ., Bronx, NY 10458]

82-002444 Schmidt, R. E. and M. McGurk. BIOLOGY OF THE EUROPEAN BITTERLING *RHODEUS SERICEUS* (PISCES: CYPRINIDAE) IN THE BRONX RIVER, NEW YORK, USA: AN APPARENTLY BENIGN EXOTIC SPECIES. *Biol. Conserv.* 24(2):157-162. Oct. 1982. SFA 27(4)
[R.D. No. 4, Box 208, Newton, NJ 07860] Selected aspects of the biology of European bitterling *Rhodeus sericeus* in southern New York were investigated as a preliminary determination of the impact of this species on the native ecosystem. There are about 900 bitterlings in the only extant North American population. The oldest specimen was in its fourth summer (III+) and all were mature in their first year. Fecundity is low, less than 60 eggs per female. Bitterlings feed primarily on diatoms and the digestive system is typical of a surface-scraping herbivore. Impact of this exotic species on the ecosystem appears minimal. It is unlikely that the species would cause appreciable negative impact on any habitat in the northeastern United States.

82-002445 Shute, P. W.; J. R. Shute and D. G. Lindquist. AGE, GROWTH AND EARLY LIFE HISTORY OF THE WACCAMAW DARTER, *ETHEOSTOMA PERLONGUM*. *Copeia* 1982(3):561-567. 10 Aug. 1982. SFA 27(4)
[Dep. Zool., Univ. Tenn., Knoxville 37916] The examination of scales, otoliths and length frequency histograms indicates that *Etheostoma perlongum* is an annual darter. Adults die soon after spawning. Growth is rapid. Darters reach half average adult size between four and eight weeks. Females attain most of their adult size by month 5, and males continue to grow through month 9 (with the exception of "stunted" males in the population). Fertilized eggs are spherical, 1.2 mm in diameter, and hatch between 120 and 168 hours at 20-23 C in aquaria. Laboratory reared larvae show a full complement of 38 myomeres by 4.9 mm SL, and become juvenile by 10.2 mm SL.

82-002446 Sreenivasan, P. V. OBSERVATIONS ON THE FISHERY AND BIOLOGY OF *MEGALASPIS CORDYLA* (LINNAEUS) AT VIZHINJAM. *Indian J. Fish.* 25(1-2):122-140. 1978. SFA 27(4)

82-002447 Tremblay, C. and F. Axelsen. BIOLOGIE ET PÊCHE DU FLÉTAN DU GROENLAND *REINHARDTIUS HIPPOGLOSSOIDES* (WALBAUM) DANS LE GOLFE DU SAINT-LAURENT. [BIOLOGY AND FISHERIES OF GREENLAND HALIBUT *REINHARDTIUS HIPPOGLOSSOIDES* (WALBAUM) OF THE GULF OF ST. LAWRENCE.] *Trav. Pech. Que.* No. 48. 101p. 1981. In French with English summ. SFA 27(4)
[Dir. Rech. Sci. Tech., 2700 rue Einstein, Ste-Foy, Quebec, Canada]

82-002448 Tugarina, P. Y. and V. S. Khramtsova. THE ECOLOGY OF THE AMUR GRAYLING, *THYMALLUS GRUBEI*. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 21(2):10-25. 1981. SFA 27(4)
[Inkutsh State Univ., USSR]

82-002449 Weber, J. J. and B. L. Les. SPAWNING AND EARLY LIFE HISTORY OF YELLOW PERCH IN THE LAKE WINNEBAGO SYSTEM. *Wis. Dep. Nat. Resour. Tech. Bull.* No. 130. 48p. 1982. SFA 27(4)

## LIFE HISTORY-GENERAL WORKS (CONTINUED)

82-002449 CONTINUED

Considerable year-to-year variation was observed in the timing of spawning and characteristics of the spawning population. Spawning began as early as 31 March and as late as 25 April, its initiation showing little relationship to any environmental factor except ice breakup in Lake Winnebago. Spawning duration varied positively with water level. Number of migrating perch increased with flow except in one year of exceptionally high flow. Age and size compositon of the spawning population was typically unimodal or bimodal, reflecting the dominance of one or two strong year classes. Spawning males were age II and older and females age III and older. Males outnumbered females an average of 2-7 times, but sex ratios as high as 51:1 were observed on a daily basis. Migration by size groups was evident, but no single pattern was observed for all study years. Calculated growth of a spring sample of spawning fish from the Fox River and a fall sample from Lake Winnebago showed that growth was greatest during the first and second years of life for length and during the fourth and fifth years for weight. Females exhibited a growth advantage over males after the first year of life. Eggs began hatching within 11-15 days after fertilization with water temperatures ranging from 2.7-21.6C. Immigration of larval perch to Lake Winnebago was confirmed by meter net captures at the river's entrance to the lake. Young perch averaged 27 mm by mid-June, when the demersal stage was reached, and 78-90 mm by the end of sampling in October. Growth was sigmoidal for both length and weight. Relative abundance of young perch sampled by trawl dropped sharply by August in all study years, suggesting that year class strength is set at midsummer of the first year of life. No correlation was found between year class strength for 13 years and May-August water temperatures in Lake Winnebago and Fox River flow during April and May. Relative abundance was not a factor in growth or mortality of young-of-the-year perch. June-October mortality of trawling-sampled perch ranged from 39 to 87% and was inversely related to mortality of seine-captured perch for the same period. Detailed food habit studies indicated all but the largest young-of-the-year perch are primarily zooplankton feeders. Food items consumed were diverse and variable, changing with habitat (littoral vs. limnetic), year and size of fish. Wide year-to-year variations were found in many aspects of yellow perch biology covered in this 6-year study, indicating the importance of long-term research on this species.--From abstr.

82-002450 Yáñez-Arancibia, A.; J. Curiel-Gómez and V. L. De Yáñez. PROSPECCIÓN BIOLÓGICA Y ECOLÓGICA DEL BAGRE MARINO *GALEICHTHYS CAERULESCENS* (GUNTHER) EN EL SISTEMA LAGUNAR COSTERO DE GUERRERO, MÉXICO (PISCES: ARIIDAE). [BIOLOGICAL AND ECOLOGICAL SURVEY OF SEA CATFISH *GALEICHTHYS CAERULESCENS* (GUNTHER) IN THE COASTAL LAGOONS SYSTEM OF GUERRERO, MEXICO (PISCES: ARIIDAE).] *An. Cent. Cienc. Mar. Limnol. Univ. Nac. Auton. Mex.* 3(1):125-180. 1976. In Spanish with English summ. SFA 27(4)
[Cent. Cienc. Mar. Limnol., Univ. Nac. Auton. Mex., Cuidad Univ., Mexico 20, D.F.]

82-002451 Yáñez-Arancibia, A. OBSERVACIONES SOBRE *MUGIL CUREMA* VALENCIENNES EN ÁREAS NATURALES DE CRIANZA, MÉXICO. ALIMENTACIÓN, CRECIMIENTO, MADUREZ Y RELACIONES ECOLÓGICAS. [OBSERVATIONS ON *MUGIL CUREMA* VALENCIENNES IN NATURAL BREEDING AREAS IN MEXICO. FEEDING, GROWTH, MATURITY AND ECOLOGICAL RELATIONSHIPS.] *An. Cent. Cienc. Mar. Limnol. Univ. Nac. Auton. Mex.* 3(1):93-124. 1976. In Spanish with English summ. SFA 27(4)
[Cent. Cienc. Mar. Limnol., Univ. Nac. Auton. Mex., Cuidad Univ., Mexico 20, D.F.]

## LIFE HISTORY-GENERAL WORKS (CONTINUED)

82-002452 Yáñez-Arancibia, A. and F. Amezcua-Linares. ECOLOGÍA DE *UROLOPHUS JAMAICENSIS* (CUVIER) EN LAGUNA DE TÉRMINOS UN SISTEMA ESTUARINO DE SUR DEL GOLFO DE MÉXICO. (PISCES: UROLOPHIDAE). [AN ECOLOGICAL STUDY OF *UROLOPHUS JAMAICENSIS* (CUVIER) IN TERMINOS LAGOON, AN ESTUARINE SYSTEM IN SOUTHERN GULF OF MEXICO. (PISCES: UROLOPHIDAE).] *An. Cent. Cienc. Mar. Limnol. Univ. Nac. Auton. Mex.* 6(2):123-136. 1979. In Spanish with English summ. SFA 27(4)
[Cent. Cienc. Mar. Limnol., Univ. Nac. Auton. Mex., Cuidad Univ., Mexico 20, D.F.]

82-002453 Yohannan, T. M. STUDIES ON THE MACKEREL FISHERY OF MANGALORE AREA DURING 1969-73. *Indian J. Fish.* 24(1-2):113-123. 1977. SFA 27(4)

82-002454 Zuerlein, G. THE WHITE PERCH IN NEBRASKA. *Nebr. Game Parks Comm. Tech. Ser.* No. 8. 108p. 1981. SFA 27(4)
[Nebr. Game Parks Comm., Lincoln]

## POPULATION STUDIES, PRODUCTION, RECRUITMENT, ETC.

82-002455 Bahr, L. M., Jr.; J. W. Day, Jr. and J. H. Stone. ENERGY COST-ACCOUNTING OF LOUISIANA FISHERY PRODUCTION. *Estuaries* 5(3):209-215. Sept. 1982. SFA 27(4)
[Cent. Wetland Resour., La. State Univ., Baton Rouge 70803] A quantitative relationship between gross primary production and secondary production of aquatic upper level consumers was derived for the inshore portion of the Louisiana coastal zone. We estimate that 1,700 units of gross primary production are requred to produce one unit of upper level consumers. Lower and mid-level consumers are estimated to require lesser amounts, 300 and 600 units, respectively. Harvested fishery groups in the inshore ecosystem represented a total average of about 23,000 metric tons (dry wt) or about $1.2x10^{11}$ Kcal ($5.0x10^{11}$ KJ) annually. This harvest "costs" the system about $7 \times 10^{13}$ Kcal ($3.3x10^{14}$ KJ) of gross primary production, or an equivalent of $4x10^{14}$ Kcal ($1.7x10^{15}$ KJ) of fossil fuel.

82-002456 Best, E. A. and W. H. Hardman. JUVENILE HALIBUT SURVEYS, 1973-1980. *Int. Pac. Halibut Comm. Tech. Rep.* No. 20. 38p. 1982. SFA 27(4)
[P.O. Box 5009, University Station, Seattle, WA 98105]

82-002457 Dhulkhed, M. H. and K. Uma Kumari. RELATIVE ABUNDANCE OF AGE GROUPS OF OILSARDINE AND ITS EFFECT ON FISHERY OF MANGALORE AREA. *Indian J. Fish.* 26(1-2):40-46. 1979. SFA 27(4)
[Mangalore Res. Cent., Cent. Mar. Fish. Res. Inst., Mangalore, India]

82-002458 Gnad, J. D. POPULATION STUDIES OF THE GUPPY, *POECILIA RETICULATA* (POECILIIDAE, PISCES). *Ph.D. dissertation, State Univ. N.Y. (Binghamton)* 208p. 1982. From Diss. Abstr. Int. B Sci. Eng. 43(3):649. Sept. 1982. SFA 27(4)

82-002459 Gordon, D. J. and H. R. MacCrimmon. JUVENILE SALMONID PRODUCTION IN A LAKE ERIE NURSERY STREAM. *J. Fish Biol.* 21(4):455-473. Oct. 1982. SFA 27(4)

## POPULATION STUDIES, PRODUCTION, RECRUITMENT, ETC. (CONTINUED)

**82-002459 CONTINUED**

[Biol. Stn., St. Andrews, NB E0G 2X0, Canada] Normandale Creek (2531 $m^2$) provides spawning and nursery grounds for lake-run rainbow trout, *Salmo gairdneri* Richardson, brown trout, *Salmo trutta* L., and coho salmon, *Oncorhynchus kisutch* (Walbaum). Upstream movements are significantly correlated with peak stream discharge ($P<0.05$). In 1973-1974, 59 adult salmonids constructed 86 nests of which 60% were disturbed by re-use or sand deposition. From a calculated deposition of 90,400 ova, 483 juveniles, 6 cm in fork length (F.L.), were resident in the stream when estimates by electrofishing first became valid. Estimated within-stream (i.e. all sections combined) monthly densities of wild juveniles > 6 cm F.L., ranged from six to 22 fish $(100\ m^2)^{-1}$, and biomass from 1.3 to 3.1 $gm^{-2}$. The highest within-section biomass was 8.3 $gm^{-2}$ in November. Additions of hatchery-reared rainbow trout temporarily increased monthly within-stream juvenile density up to 23 fish $(100\ m^2)^{-1}$, and biomass to 8.2 $gm^{-2}$. Density and biomass were positively correlated ($P<0.05$) with both instream and bank cover, and biomass negatively correlated ($P<0.05$) with gradient. The importance of substratum and flow characteristics on juvenile density and biomass was strongly indicated although not statistically significant. Annual within-section production of juveniles <6cm F.L. ranged from 4.79 to 5.93 $gm^{-2}$ $year^{-1}$ in Sections III and IV, Respectively. Inclusion of calculated probable numbers of fish <6cm F.L. increased within-section production from 5.93 to 18.65 $gm^{-2}$ $year^{-1}$ in upstream Section IV.

**82-002460** Green, D. M. POPULATION DYNAMICS AND MANAGEMENT OF LARGEMOUTH BASS (*MICROPTERUS SALMOIDES*) AND CHAIN PICKEREL (*ESOX NIGER*) IN DRYDEN LAKE, NEW YORK. *Ph.D. dissertation, Cornell Univ.* 163p. 1982. From Diss. Abstr. Int. B Sci. Eng. 43(4):968. Oct. 1982. SFA 27(4)

Population dynamics, growth, biomass and food habits of largemouth bass and chain pickerel and number and biomass of associated species in Dryden Lake were determined in 1965-1971. Second year survival of bass was highly variable and positively correlated with age 0 length in October. Bass growth was closely correlated with May to October temperatures. Beyond age 1 annual survival averaged 0.60 and total mortality was equally proportioned between summer and winter. Over 70% of the natural mortality occurred over winter. Survival of pickerel from age 0 to I was also highly variable, but was not as closely correlated with first year growth as with bass. Beyond age I annual survival of pickerel decreased with age from 0.63 at age III to 0.16 for age V and older. About 70% of the total mortality occurred over summer. Annual natural mortality increased with age from 0.26 at age II to 0.65 for V and older pickerel and was highest over winter. Although biomass of bass and pickerel was moderately high (mean 42 kg/ha), prey species were extremely abundant and, in general, slow growing. Biomass of brown bullhead, pumpkinseed, yellow perch, creek chubsucker and black crappie $\geq$15.2 cm averaged 208 kg/ha and numbers averaged 1380/ha. The complex environment created by extensive beds of aquatic plants may have decreased availability of prey species to predators. The effect of different minimum length limits on yield per recruit was examined. Maximum yield in weight occurred at minimum size limits of 12 and 14 in for bass and pickerel, respectively. Yield in weight was fairly insensitive to changes in minimum size limits over the range examined except yield of pickerel would be substantially lower at a 16 in limit. Biomass and yield in numbers of larger fish would increase if size limits were increased about the 10 in (bass) and 12 in (pickerel) limits in effect during the study. Gains in yield and improved size structure may be less than predicted from the model in complex environments like Dryden Lake. Despite high numbers of prey, growth of predators was modest and was despressed when large cohorts were produced.

## POPULATION STUDIES, PRODUCTION, RECRUITMENT, ETC. (CONTINUED)

82-002461 Hardin, T. S. A BIOLOGICAL AND ECONOMIC EVALUATION OF TROUT PRODUCTION IN PERUVIAN LAKES. *Ph.D. dissertation, Colo. State Univ.* 121p. 1982. From Diss. Abstr. Int. B Sci. Eng. 43(3):601. Sept. 1982. SFA 27(4)

82-002462 Hardin, T. S. BIOLOGY AND ECONOMICS OF PERU'S HIGH-ALTITUDE FISHERY. *Proc. Annu. Meet. Colo.-Wyo. Chap. Am. Fish. Soc.* 17:33-41. 1982. Available @ $10.00 from Mary McAfee, Colo. Div. Wildl., 711 Independent, Grand Junction, CO 81501. SFA 27(4)
[1203 Remington, Fort Collins, CO 80524]

82-002463 Havey, K. A.; D. O. Locke and C. L. Smith. A COMPARISON OF FOUR METHODS OF ESTIMATING POPULATIONS OF HATCHERY-REARED BROOK TROUT AT TOMAH LAKE, MAINE. *N. Am. J. Fish. Manage.* 1(2):186-192. 1981. SFA 27(4)
[Me. Dep. Inland Fish. Wildl., 34 Idaho Ave., Bangor 04401]

82-002464 Hesse, L. W. and B. A. Newcomb. ON ESTIMATING THE ABUNDANCE OF FISH IN THE UPPER CHANNELIZED MISSOUR RIVER. *N. Am. J. Fish. Manage.* 2(1):80-83. 1982. SFA 27(4)
[Nebr. Game Parks Comm., Fish. Div., P.O. Box 934, Norfolk 68701]

82-002465 Hightower, J. E.; R. J. Gilbert and T. B. Hess. SHORELINE AND COVE SAMPLING TO ESTIMATE SURVIVAL OF YOUNG LARGEMOUTH BASS IN LAKE OCONEE, GEORGIA. *N. Am. J. Fish. Manage.* 2(3):257-261. 1982. SFA 27(4)
[Ga. Coop. Fish. Res. Unit, Sch. For. Resour., Univ. Ga., Athens 30602]

82-002466 Kanno, Y. [ON THE SUBPOPULATION OF HERRING *CLUPEA PALLASII* IN THE OKHOTSK SEA ADJACENT TO HOKKAIDO.] *Bull. Jpn. Soc. Sci. Fish.* 48(6):755-762. June 1982. In Japanese with English summ. SFA 27(4)
[Fac. Fish., Hokkaido Univ., Hakodate 041, Japan]

82-002467 Khan, R. A.; M. Dawe; R. Bowering and R. K. Misra. BLOOD PROTOZOA AS AN AID FOR SEPARATING STOCKS OF GREENLAND HALIBUT, *REINHARDTIUS HIPPOGLOSSOIDES*, IN THE NORTHWESTERN ATLANTIC. *Can. J. Fish. Aquatic Sci.* 39(9):1317-1322. Sept. 1982. In English with French summ. SFA 27(4)
[Dep. Biol., Memorial Univ. Newfoundland, St. Johns, NF A1C 5S7, Canada]

82-002468 Luey, J. E. POPULATION DYNAMICS OF RAINBOW SMELT (*OSMERUS MORDAX*) IN WESTERN LAKE SUPERIOR. *Ph.D. dissertation, Univ. Minn.* 106p. 1982. From Diss. Abstr. Int. B Sci. Eng. 43(1):22. July 1982. SFA 27(4)

82-002469 Mortensen, E. PRODUCTION OF TROUT, *SALMO TRUTTA*, IN A DANISH STREAM. *Environ. Biol. Fishes* 7(4):349-356. 15 Sept. 1982. SFA 26(4)
[Freshwater Lab., Nat. Agency Environ. Prot., 52 Lysbrogode, DK-8600 Silkeborg, Denmark]

82-002470 Otero, H. O. and M. A. Simonazzi. LOS RECURSOS PESQUEROS DEMERSALES DEL MAR ARGENTINO. PARTE I: EVALUACION DE LA BIOMASA (STANDING STOCK) DE LA MERLUZA COMUN (*MERLUCCIUS HUBBSI*) Y DE LA MERLUZA AUSTRAL (*MERLUCCIUS POLYLEPIS*) EN EL AREA DE SU DISTRIBUCION ESTIVAL. [THE DEMERSAL FISHERIES RESOURCES OF THE ARGENTINE SEA. PART I: STANDING STOCK EVALUATION OF THE COMMON HAKE (*MERLUCCIUS HUBBSI*) AND OF THE AUSTRAL HAKE

## POPULATION STUDIES, PRODUCTION, RECRUITMENT, ETC. (CONTINUED)

82-002470 CONTINUED (*MERLUCCIUS POLYLEPIS*) IN THE AREA OF THEIR SUM DISTRIBUTION.] *Riv. Invest. Desar. Pesq.* 2(2):5-12. 1980. In Spanish wit English summ. SFA 27(4)
[INIDEP, Mar del Plata, Argentina]

82-002471 Parmanne, R. and V. Sjöblom. ABUNDANCE, MORTALITY AND PRODUCTIO OF SPRING-SPAWNING BALTIC HERRING LARVAE IN THE SEAS AROUND FINLAND IN 197 *Finn. Fish. Res.* 4:20-26. 1982. SFA 27(4)
[Finnish Game Fish. Res. Inst., Fish. Div., P.O. box 193, SF-001 Helsinki 13, Finland]

82-002472 Pirogovskiy, M. I. and T. A. Fadeyeva. THE SIZE-AGE COMPOSITIO OF THE SEVRYUGA, *ACIPENSER STELLATUS*, DURING THE MARINE PERIOD OF LIFE. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 21(4):54-63. 1981. SFA 27(4)
[TsNIORKh, Astrakhan, USSR]

82-002473 Ploskey, G. R. and R. M. Jenkins. BIOMASS MODEL OF RESERVOI FISH AND FISH-FOOD INTERACTIONS, WITH IMPLICATIONS FOR MANAGEMENT. *N. Am J. Fish. Manage.* 2(2):105-121. 1982. SFA 27(4)
[U.S. FWS, Natl. Reservoir Res. Prog., 100 West Rock St., Fayetteville, A 72701]

82-002474 Randall, R. G. and U. Paim. GROWTH, BIOMASS, AND PRODUCTION O JUVENILE ATLANTIC SALMON (*SALMO SALAR* L.) IN TWO MIRAMICHI RIVER, N BRUNSWICK, TRIBUTARY STREAMS. *Can. J. Zool.* 60(7):1647-1659. July 1982. I English with French summ. SFA 27(4)
[Mar. Fish Div., Dep. Fish Oceans, Biol. Stn., St. Andrews, NB E0G 2X Canada] The production rate of juvenile Atlantic salmon (*Salmo salar*) w estimated at four sites in two tributary streams of the Miramichi River, N Brunswick, during the period September 1976 to October 1978. Annual production ranged between 0.27 and 5.12 g/m$^2$/year$^1$. Growth was largely restricted to a 4-month period in early summer. Among the four sites, age 0 salmon attained a mean weight of between 0.95 and 3.50 g by the end of thei first growing season (September) and densities in July ranged between 0. and 3.1 fry/m$^2$. Age 1+ parr grew to mean weights between 4.95 and 12.45 g b September, and June-July densities ranged between 0.03 and 0.6 parr/m$^2$. Marking information indicated that most parr remained in the study site from July to September, but larger proportions of migrant parr were record in October. Production during summer was directly and positively related t initial population densities. Production rates at these sites were lo than most other recorded values for juvenile Atlantic salmon. Biomass o salmon may have been below the carrying capacity of the environment at al four sites.

82-002475 Sjöblom, V. and R. Parmanne. ABUNDANCE OF BALTIC HERRING A SPRAT OFF THE COAST OF FINLAND IN 1956-68 AND 1975-78 ACCORDING T EXPLORATORY FISHING WITH A PELAGIC TRAWL. *Finn. Fish. Res.* 4:14-19. 198 SFA 27(4)
[Dep. Limnol., Univ. Helsinki, Viikki, SF-00710 Helsinki 71, Finland]

## SPAWNING HABITS AND MOVEMENTS, FECUNDITY, ETC.

82-002476 Aneer, G. and S. Nellbring. A SCUBA-DIVING INVESTIGATION OF BALTIC HERRING (*CLUPEA HARENGUS MEMBRAS* L.) SPAWNING GROUNDS IN THE ASKÖ-LANDSORT AREA, NORTHERN BALTIC PROPER. *J. Fish Biol.* 21(4):433-442. Oct. 1982. SFA 27(4)

[Askö Lab., Inst. Mar. Ecol., Univ. Stockholm, S-106 91 Stockholm, Sweden] In a spawning area survey in the Askö area, northern Baltic proper, undertaken in the beginning of summer 1978, 100 randomly established and sampled transects were studied by diving. Herring spawn was found at 45 of the transects. The eggs were usually found on *Pilayella littoralis*, a filamentous brown algae, at the more exposed transects. Eggs were only found down to a depth of 11 m. In a neighbouring oil spill area spawn were found at only four out of 20 transects. Of eggs taken to the laboratory for hatching, 54% of those from the unaffected area hatched but only 25% of those from the oil spill area.

82-002477 Baglin, R. E., Jr. REPRODUCTIVE BIOLOGY OF WESTERN ATLANTIC BLUEFIN TUNA. *NOAA Fish. Bull.* 80(1):121-134. Jan. 1982. *SFA* 27(4)

[NMFS, c/o Alaska Dep. Fish Game, P.O. Box 686, Kodiak 99615] Ovaries of bluefin tuna, *Thunnus thynnus*, were collected from the Gulf of Mexico, Florida Straits, Middle Atlantic Bight of the western North Atlantic, and off the northeast coast of the United States. There was relatively little development towards maturity in age 1 through age 7 fish from the Middle Atlantic Bight as evidenced by low gonosomatic index values and histological examination of ovaries. Well-developed ovaries were present in giant bluefin tuna from the Gulf of Mexico and Florida Straits, with heaviest spawning occurring in May. For bluefin tuna measuring 205-269 cm fork length and 156-324 kg round weight, the average number of eggs measuring 0.33 mm in diameter and larger was estimated at 60.3 million, and the average number of eggs measuring 0.47 mm in diameter and larger was estimated at 34.2 million.

82-002478 Beland, K. F.; R. M. Jordan and A. L. Meister. WATER DEPTH AND VELOCITY PREFERENCES OF SPAWNING ATLANTIC SALMON IN MAINE RIVERS. *N. Am. J. Fish. Manage.* 2(1):11-13. 1982. SFA 27(4)

[Atl. Sea-Run Salmon Comm., Water St., Machias, ME 04654]

82-002479 Billard, R. THE REPRODUCTIVE CYCLE IN TELEOST FISH. *Riv. It. Piscic. Ittiop.* 17(2):48-72. Apr.-May-June 1982. In English and Italian. SFA 27(4)

[Lab. Physiol. Poissons, I.N.R.A., 78350 Jouy-en-Josas, France]

82-002480 Birman, I. B. OCEAN MIGRATION AND ORIGIN OF SEASONAL RACES OF ANADROMOUS SALMON (SALMONIDAE). *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 21(1):35-47. 1981. SFA 27(4)

[KoTINRO, Petropavlovsk-Kamchatskiy, USSR]

82-002481 Brown, L. and J. F. Downhower. POLYGAMY IN THE MOTTLED SCULPINS (*COTTUS BAIRDI*) OF SOUTHWESTERN MONTANA (PISCES: COTTIDAE). *Can. J. Zool.* 60(8):1973-1980. Aug. 1982. SFA 27(4)

[Dep. Biol., George Mason Univ., Fairfax, VA 22030] Relationships among est sites, guardian male size, and male courtship success (number of atings per male) were examined in 11 populations of mottled sculpins (*Cottus bairdi*) in the Madison River in southwestern Montana during the 1978 nd 1979 breeding seasons. The number of matings per breeding male ranged rom 1 to 12. Sites used as nests were not a random sample of available ites but were larger than average-sized rocks on the stream bed. Larger ales had larger nest sites. Male courtship success was sometimes orrelated with nest size. The best predictor of male mating success was ale size. These

## SPAWNING HABITS AND MOVEMENTS, FECUNDITY, ETC. (CONTINUED)

82-002481 CONTINUED observations are consistent with the hypothesis th
polygamy in mottled sculpins has evolved through female choice, not throu
resource defense.

82-002482 Buzeta, M. and K. G. Waiwood. FECUNDITY OF ATLANTIC COD (*GAD*
*MORHUA*) IN THE SOUTHWESTERN GULF OF ST. LAWRENCE. *Can. Tech. Rep. Fis*
*Aquatic Sci.* No. 1110. iii + 6p. May 1982. In English with French summ. S
27(4)
[Biol. Stn., St. Andrews, NB E0G 2X0, Canada] Fecundity estimates we
made on 30 Atlantic cod (*Gadus morhua*) specimens collected from t
southwestern Gulf of St. Lawrence in 1980. Maturing ovaries were places
Gilson's fluid to free ripening oocytes from their follicles. Absolut
fecundity was estimated by measuring the collective volume of eggs larg
than 250µ, counting the number of eggs in 0.5-ml subsamples and adjusting
the appropriate multiplication factor. Fecundity-size relationships wer
evaluated, using regression analysis, and subsequently compared with thos
derived from previous studies for this and ohter cod populations. Th
fecundity-size relationship giving best fit was of the form $F = aW^b$, and th
average relative fecundity was found to be 279 eggs/g of body weight.
method to reduce clumping of eggs and to increase efficiency of sampl
preparation is described. The contribution of non-follicular tissue t
relative overy weight was estimated.

82-002483 Ciechomski, J. de and M. C. Cassia. REPRODUCCION Y FECUNDIDA
DEL SUREL (*TRACHURUS PICTURATUS AUSTRALIS*). [REPRODUCTION AND FECUNDITY O
THE JACK MACKEREL, *TRACHURUS PICTURATUS AUSTRALIS* OFF ARGENTINA, IN MAR DE
PLATA AREA.] *Riv. Invest. Desar. Pesq.* 2(2):39-45. 1980. SFA 27(4)
[INIDEP, Mar del Plata, Argentina]

82-002484 Cole, K. S. MALE REPRODUCTIVE BEHAVIOUR AND SPAWNING SUCCESS I
A TEMPERATE ZONE GOBY, *CORYPHOPTERUS NICHOLSI*. *Can. J. Zool.* 60(10):2309-
2316. Oct. 1982. In English with French summ. SFA 27(4)
[Dep. Biol., Univ. Saskatchewan, Saskatoon, SK S7N 0W0, Canada]
*Coryphopterus nicholsi* is a temperate zone marine goby. In laboratory
groups of fish, females preferentially spawn with dominant males;
assessment of dominance appears to be based upon courting vigour. Male size
(standard length) and dominance were often, but not always, highly
correlated. In contrast, there was no consistent correlation betwee
territorial quality and spawning success. Smaller males in laboratory
groups did not court females or guard eggs. However, their behaviour and
testicular development during the reproductive season suggest that they may
engage in sneak spawning. Dominant males are more likely to successfully
guard eggs against conspecific predators than are subordinate males, and
hence females should have greater reproductive success if they choose
dominant males for spawning partners.

82-002485 Cooper, J. J. OBSERVATIONS ON THE REPRODUCTION AND EMBRYOLOGY O
THE LAHONTAN TUI CHUB, *GILA BICOLOR*, IN WALKER LAKE, NEVADA. *Great Basi*
*Nat.* 42(1):60-64. 31 Mar. 1982. SFA 27(4)
[Bioresour. Cent., Desert Res. Inst., Reno, NV 89506] Various aspects o
the reproduction and embryology of Walker Lake Lahontan tui chub, *Gil*
*bicolor*, were investigated during the spring-summer period of 1976, 1977,
and 1981. Tui chub were found to spawn in littoral regions of the la
beginning in late May or early June. Early in the season male ch
substantially outnumbered females over the spawning grounds, with a normal
1:1 sex ratio gradually approached as the season progressed. Th
developmental period between fertilization to hatch-out was shortened b
increases in water temperature. Selected stages of embryonic developme
are described from egg fertilization through post-hatch.

## SPAWNING HABITS AND MOVEMENTS, FECUNDITY, ETC. (CONTINUED)

82-002486 Damas, T.; N. Millares; M. Borrero and E. González. FECUNDIDAD EN BIAJAIBA (*LUTJANUS SYNAGRIS*, LINNAEUS 1758). [FECUNDITY OF SNAPPER (*LUTJANUS SYNAGRIS*, LINNAEUS 1758).] *Rev. Cubana Invest. Pesq.* 4(3):18-23. 1979. In Spanish with English summ. SFA 27(4)
[Cent. Invest. Pesq., Miramar, Havana, Cuba]

82-002487 Dan, S. S. INTRAOVARIAN STUDIES AND FECUNDITY IN *NEMIPTERUS JAPONICUS* (BLOCH). *Indian J. Fish.* 24(1-2):48-55. 1977. SFA 27(4)

82-002488 Dan, S. S. MATURITY, SPAWNING AND FECUNDITY OF CATFISH *TACHYSURUS TENUISPINIS* (DAY). *Indian J. Fish.* 24(1-2):96-106. 1977. SFA 27(4)

Fecundity in *Tachysurus tenuispinis* of size range 28.5-42.4 cm varied from 29 to 82. It increased with increasing size. The linear relationship between weight and fecundity was more valid than that of length and fecundity. The fish breed once a year during May-September. The minimum size at first maturity was 27.5 cm total length. The females dominated the commercial catch and the male:female ratio was 1:1.79. Parental care noticed in males is described.

82-002489 Devadoss, P. MATURATION AND BREEDING HABIT OF *DASYATIS (AMPHOTISTIUS) IMBRICATUS* (SCHNEIDER) AT PORTO NOVO. *Indian J. Fish.* 25(1-2):29-34. 1978. SFA 27(4)

In *Dasyatis imbricatus* only the ovary and the uterus on the left side are functional. It has a prolonged breeding season from December to July and produces 1 or 2 embryos. The ova are ready for ovulation even before the parturition of the embryo in the uterus. The females reach maturity when they attain the size of 170-179mm as confirmed by the ponderal index. The males in the 160-169mm size group are mature as judged by the relationship between body length and clasper length. Sexes in the commercial catches vary--51.25% males to 48.75% females.

82-002490 Dorr, J. A. III; D. V. O'Connor; N. R. Foster and D. J. Jude. SUBSTRATE CONDITIONS AND ABUNDANCE OF LAKE TROUT EGGS IN A TRADITIONAL SPAWNING AREA IN SOUTHEASTERN LAKE MICHIGAN. *N. Am. J. Fish. Manage.* 1(2):165-172. 1981. SFA 27(4)
[Great Lakes Res. Div., Univ. Mich., Ann Arbor 48109]

82-002491 Dupuis, H. M. C. and M. H. A. Keenleyside. EGG-CARE BEHAVIOUR OF *AEQUIDENS PARAGUAYENSIS* (PISCES, CICHLIDAE) IN RELATION TO PREDATION PRESSURE AND SPAWNING SUBSTRATE. *Can. J. Zool.* 60(8):1794-1799. Aug. 1982. In English with French summ. SFA 27(4)
[Dep. Zool., Univ. Western Ontario, London, ON N6A 5B7, Canada]

82-002492 Fraser, J. M. AN ATYPICAL BROOK CHAR (*SALVELINUS FONTINALIS*) SPAWNING AREA. *Environ. Biol. Fishes* 7(4):385-388. 15 Sept. 1982. SFA 27(4)
[Ontario Minist. Nat. Resour., Box 50, Maple, ON L0J 1E0, Canada]

82-002493 Gross, M. R. SNEAKERS, SATELLITES AND PARENTALS: POLYMORPHIC MATING STRATEGIES IN NORTH AMERICAN SUNFISHES. *Z. Tierpsychol.* 60(1):1-26. Sept. 1982. SFA 27(4)

## SPAWNING HABITS AND MOVEMENTS, FECUNDITY, ETC. (CONTINUED)

82-002493 CONTINUED
[Dep. Biol., Univ. Utah, Salt Lake City] In North American sunfishe (*Lepomis*: Centrarchidae) ♀♀ build nests and provide solitary parental ca for the young. In this paper I provide for bluegill (*L. macrochirus*) detailed account of ♀♀ which do not build nests, but steal fertilizatio from the nests of other ♀♀. I begin by giving data on the behavior, morphology, and population demography of ♀♀. Next, through an analysis o individual male life-histories, I show that cuckoldry and parenting a discrete alternative reproductive strategies. This is followed by theoretical analysis and an empirical test of cuckoldry and parental care evolutionarily stable strategies (a mixed ESS). Several predictions a made concerning how natural selection will influence the life-histor dynamics of these strategies. A general theory is then developed fo sunfishes, and a first test made on the pumpkinseed (*L. gibbosus*). Finally, I note the parallels between male cuckoldry in sunfishes and precocial ma life-histories in salmon and cichlids.

82-002494 Hails, A. J. and Z. Abdullah. REPRODUCTIVE BIOLOGY OF T TROPICAL FISH *TRICHOGASTER PECTORALIS* (REGAN). *J. Fish Biol.* 21(2):157-170. Aug. 1982. SFA 27(4)
[Zool. Dep., Univ. Malaya, Lembah Pantai, Kuala Lumpur 22-11, Malaysia] The breeding cycle of an air-breathing Anabantid, *Trichogaster pectorali* was studied in Malaysia. The species was found to breed all the year b with pronounced peaks of activity associated with the two wetter periods i the year. The advantages of this timing and the cues which stimulate gonadal activity are discussed. From the study of oocyte distribution in selecte ovaries it was concluded that *T. pectoralis* is a total spawner although batch of ripe oocytes may be released over an extended period of tim. Fecundity was found to be related to length of fish by the formula (log Egg no.)=-4.6854+4.3080 $\log_{10}$ standard length (s.l.) (mm).

82-002495 Ivanova, M. N. and V. M. Volodin. VARIABILITY IN RATE OF SEXU MATURATION IN FRESHWATER POPULATIONS OF THE SMELT, *OSMERUS EPERLANUS. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 21(3):28-37. 1981. SFA 27(4)
[Inst. Biol. Inland Waters, USSR Acad. Sci., Borok, Yaroslavl Reg., USSR]

82-002496 Jonsson, B. and K. Hindar. REPRODUCTIVE STRATEGY OF DWARF NORMAL ARCTIC CHARR (*SALVELINUS ALPINUS*) FROM VANGSVATNET LAKE, WESTE NORWAY. *Can. J. Fish. Aquatic Sci.* 39(10):1404-1413. Oct. 1982. In Englis with French summ. SFA 27(4)
Dir. Wildl. Freshwater Fishes, Res. Stn. Freshwater Fishes at Ims, Ims, 4300 Sandnes, Norway]

82-002497 Kortmulder, K. ETHO-ECOLOGY OF SEVENTEEN *BARBUS* SPECIE (PISCES; CYPRINIDAE). *Neth. J. Zool.* 32(2):144-168. Aug. 1982. SFA 27(4)
[Zool. Lab., Kaiserstraat 63, 2300 RA Leiden, Netherlands]

82-002498 Krykhtin, M. L. and E. I. Gorbach. REPRODUCTIVE ECOLOGY OF T GRASS CARP, *CTENOPHARYNGODON IDELLA*, AND THE SILVER CAR *HYPOPHTHALMICHTHYS MOLITRIX*, IN THE AMUR BASIN. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 21(2):109-123. 1981. SFA 27(4)
[AoTINRO, Khabarovsk, USSR]

## SPAWNING HABITS AND MOVEMENTS, FECUNDITY, ETC. (CONTINUED)

82-002499 Ludqvist, H. and G. Fridberg. SEXUAL MATURATION VERSUS IMMATURITY: DIFFERENT TACTICS WITH ADAPTIVE VALUES IN BALTIC SALMON (*SALMO SALAR* L.) MALE SMOLTS. *Can. J. Zool.* 60(8):1822-1827. Aug. 1982. In English with French summ. SFA 27(4)
[Dep. Ecol. Zool., Univ. Umeå, S-901 87 Umeå, Sweden]

82-002500 Mojumder, P. MATURITY AND SPAWNING OF THE CAT FISH *TACHYSURUS THALASSINUS* (RUPPEL) OFF WALTAIR COAST. *Indian J. Fish.* 25(1-2):109-121. 1978. SFA 27(4)

*Tachysurus thalassinus* breeds once a year, during April to August, with peak period between May and July. The fish probably breeds in deep offshore waters which are not fished regularly at present. The average length and fish maturity is 36cm. The sexes are equally distributed in the commercial catch. Fecundity (total number of mature eggs per female) varies between 25 and 42. Parental care is exhibited by males.

82-002501 Moore, R. SPAWNING AND EARLY LIFE HISTORY OF BARRAMUNDI, *LATES CALCARIFER* (BLOCH), IN PAPUA NEW GUINEA. *Aust. J. Mar. Freshwater Res.* 33(4):647-661. 1982. SFA 27(4)
[P.O. Box 35, Thursday Island, Queensland 4875, Australia] *L. calcarifer* in western Papua is catadromous, undertaking substantial migrations to specific spawning grounds. The location and environmental characteristics of these spawning grounds and possible spawning stimuli are discussed. The annual spawning period extends from October to February but that for individual fish is relatively short. Fecundity (*F*) varies from $2.3X10^6$ to $32.2X10^6$ within the weight range 7.7-20.8kg, being related to the total weight *W* (in kilograms) by the relatioship $F$=$1.942WX10^6$-$13.816X10^6$. The eggs, larvae and juveniles are described. Larvae leave coastal waters when approximately 5mm long and enter coastal nursery swamps where they remain until the attain a length of 200-300mm. They then return to coastal waters as the nursery swamps begin to dry out (June-July).

82-002502 Neudecker, S. and P. S. Lobel. MATING SYSTEMS OF CHAETODONTID AND POMACANTHID FISHES AT ST. CROIX. *J. Comp. Ethol.* 59(4):299-318. Aug. 1982. SFA 27(4)
[Natl. Underwater Lab. Syst., Fairleigh Dickinson Univ., West Indies Lab., Christiansted, St. Croix, U.S. Virgin Islands]

82-002503 Pati, S. ON THE MATURATION AND SPAWNING OF CHINESE POMFRET *PAMPUS CHINENSIS* (EUPHRASEN) FROM ORISSA COAST. *Indian J. Fish.* 26(1-2):150-162. 1979. SFA 27(4)
[Dep. Zool., Ravenshaw Coll., Cuttach, Orissa, India]

82-002504 Patzner, R. A. DIE REPRODUKTION DER MYXINOIDEN. EIN VERGLEICH VON *MYXINE GLUTINOSA* UND *EPTATRETUS BURGERI*. [THE REPRODUCTION OF MYXINOIDS. A COMPARISON OF *MYXINE GLUTINOSA* AND *EPTATRETUS BURGERI*.] *Zool. Anz.* 208(3-4):132-144. 1982. In German with English summ. SFA 27(4)
[Zool. Inst. Univ., Akademiestr. 26, A-5020 Salzburg, Austria]

2-002505 Raina, H. S. OBSERVATIONS ON THE FECUNDITY AND SPAWNING BEHAVIOUR OF *SCHIZOTHORAX ESOCINUS* HECKEL FROM DAL LAKE, KASHMIR. *Indian J. Fish.* 24(1-2):201-203. 1977. SFA 27(4)

## SPAWNING HABITS AND MOVEMENTS, FECUNDITY, ETC. (CONTINUED)

82-002506 Sil'yanova, Z. S. OOGENESIS AND STAGES OF MATURITY OF FISHES O THE FAMILY NOTOTHENIIDAE. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 21(4):81-89. 1981. SFA 27(4)
[VNIRO, Moscow, USSR]

82-002507 Somasekharan Nair, K. V. MATURITY AND SPAWNING OF *JOHNI (JOHNIEOPS) SINA* (CUVIER) AT CALICUT DURING 1969-72. *Indian J. Fish.* 24(1-2):15-24. 1977. SFA 27(4)

82-002508 Sunder, S. and C. B. Joshi. PRELIMINARY OBSERVATIONS ON T SPAWNING OF *TOR PUTITORA* (HAMILTON) IN ANJI STREAM, JAMMU PROVINCE DURI 1969. *Indian J. Fish.* 24(1-2):253-258. 1977. SFA 27(4)

82-002509 Tanaka, Y.; K. Suzuki and A. Doi. [REPRODUCTION AND EARLY LI HISTORY OF THE GOBIOID FISH, *ELEOTRIODES HELSDINGENI* BLEEKER.] *J. Fac. Mar. Sci. Technol. Tokai Univ.* No. 15. p. 367-376. 1982. In Japanese with Engli summ. SFA 27(4)

82-002510 Tokranov, A. M. RATE OF SEXUAL MATURATION AND FECUNDITY OF T STAGHORN SCULPIN, *GYMNOCANTHUS DETRISUS* (COTTIDAE), OFF THE EAST COAST O KAMCHATKA. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 21(1):76-82. 1981. SFA 27(4)
[KoTINRO, Petropavlovsk-Kamchatskiy, USSR]

82-002511 Wagner, W. C. REPRODUCTION OF PLANTED LAKE TROUT IN LA MICHIGAN. *N. Am. J. Fish. Manage.* 1(2):159-164. 1981. SFA 27(4)
[Mich. Dep. Nat. Resour., Marquette Fish. Res. Stn., Marquette 49855]

82-002512 Warner, R. R. MATING SYSTEMS, SEX CHANGE AND SEXUAL DEMOGRAP IN THE RAINBOW WRASSE, *THALASSOMA LUCASANUM*. *Copeia* 1982(3):653-661. Aug. 1982. SFA 27(4)
[Mar. Sci. Inst., Univ. Calif., Santa Barbara 93106]

82-002513 Yuuki, Y. [SPAWNING AND MATURITY OF A STERNOPTYCHID FIS *MAUROLICUS MUELLERI* IN THE SOUTH WESTERN WATERS OF THE SEA OF JAPAN.] *Bull. Jpn. Soc. Sci. Fish.* 48(6):749-753. June 1982. In Japanese with Engli summ. SFA 27(4)
[Shimane Pref. Fish. Exp. Stn., Setogashima, Hamada 697, Japan]

82-002514 Zelenkov, V. M. EARLY GAMETOGENESIS AND SEX DIFFERENTIATION I THE PERCH, *PERCA FLUVIATILIS*. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.* 21(2):124-130. 1981. SFA 27(4)
[PINRO, Murmansk, USSR]

## MOVEMENTS, SEASONAL AND DEPTH DISTRIBUTION, ETC.

82-002515 Beecher, H. A. and W. C. Hixson. SEASONAL ABUNDANCE OF FISHES I THREE NORTHWEST FLORIDA RIVERS. *Fla. Sci.* 45(3):145-171. 1982. SFA 27(4)
[Wash. Dep. Game, 600 N. Capitol Way, Olympia 98504] The season abundances of 39 fish species in electrofishing collections were compar in the Escambia, Choctawhatchee, and Apalachicola rivers in northwe Florida. Relative abundances, as indicated by catch per unit effort electrofishing,

## MOVEMENTS, SEASONAL AND DEPTH DISTRIBUTION, ETC. (CONTINUED)

82-002515 CONTINUED were examined in the Escambia River. *Lepisosteus osseus*, *Dorosoma cepedianum*, *D. petenense*, and *Mugil cephalus* were abundant during winter and spring high water in all 3 rivers, but seasonal patterns were less distinct in the larger Apalachicola. These seasonal euryhaline fishes and the catostomids contributed the greatest amounts to the fish biomass in the Escambia River. The abundance of *Carpiodes cyprinus* declined in the fall during low water, despite increased catch rates of other resident fishes. Female *C. velifer* outnumbered males during summer, but in winter sex ratios approached 1:1. Male *C. velifer* were more numberous downstream in late summer. A mark-and-recapture study of *Moxostoma poecilurum*, a dominant resident in the Escambia River, indicated 1095±504 in a 1km segment of the Escambia River. *Lepomis macrochirus* and *L. megalotis* were 2 of the most abundant fishes in the Escambia River.

82-002516 Bernard, D. R. and E. K. Israelsen. INTER- AND INTRASTREAM MIGRATION OF CUTTHROAT TROUT (*SALMO CLARKI*) IN SPAWN CREEK, A TRIBUTARY OF THE LOGAN RIVER, UTAH. *Northwest Sci.* 56(2):148-158. May 1982. SFA 27(4)
[Alaska Dep. Fish Game, 333 Raspberry Rd., Anchorage 99502] We investigated inter- and intrastream movements of fluvial cutthroat trout (*Salmo clarki*) within Spawn Creek and between this stream and the Logan River, Utah. From November 1973 through November 1975, we captured all migrants with a fish trap on Spawn Creek and tagged adult cutthroat trout. Monthly from July 1973 through November 1975, we electrofished parts of Spawn Creek and cold-branded all unmarked juveniles and adults. Also, we continuously measured water temperature and stream flows at the trap. During the spawning season in 1974, 39 cutthroat trout entered Spawn Creek and 23 left; and in 1975, 77 fish entered and 71 left the stream. Spawning migrants entered Spawn Creek when spring freshets from melting snow increased stream flows and turbidity. Tag returns from fishermen indicated adult cutthroat trout traveled to the Logan River after leaving Spawn Creek. In 1974, 229 and in 1975, 359 cutthroat trout fry left Spawn Creek in early fall when dwindling stream flows reduced habitat along stream margins. Migratory patterns of adults and fry show cutthroat trout use Spawn Creek for spawning and the Logan River for growing. Spawn Creek contains extensive spawning habitat with little deep-water habitat while the Logan River is its complement. In 1974 and 1975, respectively, 30 and 13 cutthroat trout (age 1 and older) constituted fall runs into Spawn Creek. Intrastream movements of cutthroat trout within Spawn Creek were extensive, with 35 percent of recaptured fish having moved from where released.

2-002517 Combs, D. L. and L. R. Peltz. SEASONAL DISTRIBUTION OF STRIPED ASS IN KEYSTONE RESERVOIR, OKLAHOMA. *N. Am. J. Fish. Manage.* 2(1):66-73. 982. SFA 27(4)
[Northeast Reg. Off., Okla. Dep. Wildl. Conserv., Rt. 1, Box 75-B, Porter 4454]

2-002518 Conover, D. O. and S. A. Murawski. OFFSHORE WINTER MIGRATION OF HE ATLANTIC SILVERSIDE, *MENIDIA MENIDIA*. *NOAA Fish. Bull.* 80(1):145-150. an. 1982. SFA 27(4)
[Mar. Sci. Res. Cent., State Univ. N.Y., Stony Brook 11794]

2-002519 Dewey, M. R. SEASONAL ABUNDANCE, MOVEMENT AND DIVERSITY OF ISHES IN AN OZARK STREAM. *Arkansas Acad. Sci. Proc.* 35:33-39. 1981. SFA 7(4)
[U.S. FWS, P.O. Box 705, Ouachita Baptist Univ., Arkadelphia, AR 71923]

## MOVEMENTS, SEASONAL AND DEPTH DISTRIBUTION, ETC. (CONTINUED)

82-002520 Hourston, A. S. HOMING BY CANADA'S WEST COAST HERRING
MANAGEMENT UNITS AND DIVISIONS AS INDICATED BY TAG RECOVERIES. *Can. J. Fi*
*Aquatic Sci.* 39(10):1414-1422. Oct. 1982. In English with French summ.
27(4)
[Dep. Fish. Oceans, Resour. Serv. Br., Pac. Biol. Stn., Nanaimo, BC
5K6, Canada]

82-002521 Hoyt, R. D. and W. H. Kruskamp. SEASONAL OCCURRENCES
MOVEMENT PATTERNS OF FISH IN THE BARREN RIVER, KENTUCKY. *Trans. Ky. Ac*
*Sci.* 43(3-4):168-175. Sept. 1982. SFA 27(4)
[Dep. Biol., West. Ky. Univ., Bowling Green 42101] The Barren Rive
Kentucky was electrofished from October 1979 to August 1980 to determi
seasonal occurrences and movement patterns of fishes in relation
discharges from Barren River Lake. The greatest number of fishes observe
primarily small gizzard shad, was during the winter months, paritcular
February. These small shad were observed throughout the study area of t
Barren River and probably resulted from being drawn through the dam duri
periods of high discharge and upstream migration from the Green River.
greatest number of fishes per km of river sampled occurred in spring j
below the dam. Movements of tagged fish were most evident in winter, b
showed no upstream vs. downstream tendencies. The greatest distan
travelled by any individual was 17 km. Fish capture was relat
significantly to water temperature and lake discharge, fish number bei
inversely related to temperature and directly related to discharge.

82-002522 Ikonen, E. MIGRATION OF RIVER-SPAWNING WHITEFISH IN THE GULF
FINLAND. *Finn. Fish. Res.* 4:40-45. 1982. SFA 27(4)
[Finn. Game Fish. Res. Inst., Fish. Div., P.O. Box 193, SF-00131, Helsin
13, Finland]

82-002523 Lyovin, A. V. DISTRIBUTION AND BEHAVIOR OF YOUNG RUSSI
STURGEON, *ACIPENSER GULDENSTADTI* (ACIPENSERIDAE), IN THE CASPIAN SEA.
*Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 21(2):138-144. 1981. SFA 27(4)
[TsNIORKh, Astrakhan, USSR]

82-002524 Moore, R. and L. F. Reynolds. MIGRATION PATTERNS OF BARRAMUND
*LATES CALCARIFER* (BLOCH), IN PAPUA NEW GUINEA. *Aust. J. Mar. Freshwater*
33(4):671-682. 1982. SFA 27(4)
[P.O. Box 35, Thursday Island, Queensland 4875, Australia] Adult
*calcarifer* released in inland waters migrated to coastal spawning ground
and those released on the spawning grounds returned to inland areas. Of 63
fish tagged throughout western Papua, 978 (15.4%) recaptures were record
the maximum distance between release and recapture being 622 km.
recoveries indicated that these adult fish return to the same general ar
from which they originally migrated. Juveniles leave coastal nursery sw
when about 6 months old and by the end of their first year have bec
distributed throughout coastal and estuarine regions. During their sec
or third year they move into inland waters, although there is a resid
population of all age classes that remains resident in coastal waters. So
3-year-old, and a significant number of 4-year-old, fish undertake t
annual migration from inland to coastal waters. Prevailing clima
conditions appear to affect the magnitude of this migration as not all
the adult fish migrate to coastal waters every year. Factors affecting th
migration are discussed.

## MOVEMENTS, SEASONAL AND DEPTH DISTRIBUTION, ETC. (CONTINUED)

82-002525 Peterson, N. P. IMMIGRATION OF JUVENILE COHO SALMON (*ONCORHYNCHUS KISUTCH*) INTO RIVERINE PONDS. *Can. J. Fish. Aquatic Sci.* 39(9):1308-1310. Sept. 1982. In English with French summ. SFA 27(4)
[Wash. Dep. Fish., Forks 98331]

82-002526 Sablin, V. V. and V. P. Pavlychev. THE INFLUENCE OF THERMAL CONDITIONS ON THE MIGRATION AND CATCH OF THE SAURY, *COLOLABIS SAIRA*, IN THE NORTH-WEST PACIFIC. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 21(3):21-27. 1981. SFA 27(4)
[TINRO, Vladivostok, USSR]

82-002527 Sameoto, D. VERTICAL DISTRIBUTION AND ABUNDANCE OF THE PERUVIAN ANCHOVY, *ENGRAULIS RINGENS*, AND SARDINE, *SARDINOPS SAGAX*, LARVAE DURING NOVEMBER 1977. *J. Fish Biol.* 21(2):171-185. Aug. 1982. SFA 27(4)
[Bedford Inst. Oceanogr., P.O. Box 1006, Dartmouth, NS B2Y 4A2, Canada]

82-002528 Savoie, L. B. and K. L. Casanova. A STUDY OF AREAL AND SEASONAL ABUNDANCE OF THE AMERICAN EEL (*ANGUILLA ROSTRATA*) AT SELECTED SITES IN SOUTHEASTERN COASTAL LOUISIANA. *La. Dep. Wildl. Fish. Tech. Bull.* No. 34. 27p. May 1982. SFA 27(4)

82-002529 Sugiwaka, K.; H. Tanaka; N. Kasahara and K. Araya. [SMOLT RUN IN THE SEA BY TAGGING EXPERIMENT OF POND-REARED SMOLT OF MASU SALMON (*ONCORHYNCHUS MASOU*).] *Sci. Rep. Hokkaido Fish Hatchery* No. 36. p. 11-31. Dec. 1981. In Japanese with English summ. SFA 27(4)
[Hokkaido Fish Hatchery, Nakanoshima, Toyohira-ku, Sapporo, Hokkaido, Japan]

## FOODS/FEEDING

82-002530 Adams, S. M.; R. B. McLean and M. M. Huffman. STRUCTURING OF A PREDATOR POPULATION THROUGH TEMPERATURE-MEDIATED EFFECTS ON PREY AVAILABILITY. *Can. J. Fish. Aquatic Sci.* 39(8):1175-1184. Aug. 1982. In English with French summ. SFA 27(4)
[Environ. Sci. Div., Oak Ridge Natl. Lab., Oak Ridge, TN 37830]

82-002531 Allan, J. D. THE EFFECTS OF REDUCTION IN TROUT DENSITY ON THE INVERTEBRATE COMMUNITY OF A MOUNTAIN STREAM. *Ecology* 63(5):1444-1455. Oct. 1982. SFA 27(4)
[Dep. Zool., Univ. Md., College Park 20742] An experimental reduction in trout density was carried out for 4 yr to determine whether the numbers or species composition of aquatic invertebrates would be affected. In a Colorado stream, the standing crop of trout (mainly *Salvelinus fontinalis*) prior to this study was 4.86 g/m², typical of infertile trout streams. Repeated electroshocking of a 1220 m long experimental section kept trout stocks at 10-25% of this initial value during the summers of 1975-1978. Density of invertebrates in the benthos (number of invertebrates per square metre) showed no consistent differences between the trout removal section and upstream and downstream control sections for the majority of taxa examined. Drift density (number of invertebrates per 1000 cubic metres) also failed to show an effect of the trout removal. Some taxa were significantly more abundant at one site than another, but this was attributable to changes along the stream gradient or differences in phenology among the sites rather than experimental reduction of trout. As trout stomach content analysis

FOODS/FEEDING (CONTINUED)

82-002531 CONTINUED revealed very intensive grazing on a few taxa aquatic insects, their failure to increase in the trout removal section unexpected. Statistical analysis showed that because of the variability the system, a doubling or halving of numbers must occur to be detectabl Within these limits, it is concluded that removal of trout had significant effect on the prey community, and two explanations are offere Trout may actually consume only a small fraction of total prey, althou this conclusion is limited by inability of current techniques to sample benthos fully. It is also likely that because streams do not provide are where fish are predictably absent, the invertebrate community is hig adapted to fish predation and so is not sensitive to manipulations in fi density.

82-002532 Arai, M. N. and D. E. Hay. PREDATION BY MEDUSAE ON PACIF HERRING (*CLUPEA HARENGUS PALLASI*) LARVAE. *Can. J. Fish. Aquatic Sci* 39(11):1537-1540. Nov. 1982. In English with French summ. SFA 27(4)
[Dep. Fish. Oceans, Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada]

82-002533 Axell, M. FEEDING OF COD IN THE ÅLAND SEA AND ITS INFLUENCE THE STOCKS OF HERRING AND SPRAT. *Finn. Fish. Res.* 4:35-39. 1982. SFA 27(4)
[Finn. Game Fish. Res. Inst., Fish. Div., Vaasa Field Stn., Rantakatu SF-65120 Vaasa 12, Finland]

82-002534 Blay, J., Jr. and K. N. Eyeson. FEEDING ACTIVITY AND FOOD HABI OF THE SHAD, *ETHMALOSA FIMBRIATA* (BOWDICH), IN THE COASTAL WATERS OF C COAST, GHANA. *J. Fish Biol.* 21(4):403-410. Oct. 1982. SFA 27(4)
[K. N. Eyeson: Dep. Zool., Univ. Cape Coast, Cape Coast, Ghana] monthly feeding activity and food habits of populations of *Ethmalo fimbriata* occurring in the sea and an estuary in Cape Coast, Ghana distri were investigated during a 14-month period. The juvenile fish, whose to length (T.L.) ranged from 5.3 to 14.7 cm, occur in the estuary and appea to be more active feeders than the marine samples which measured 15.0-30 cm. The peak feeding activity in the marine population coincided with onset of 'upwelling' in the sea, which period is characterized by salinities, decreasing temperatures and high zooplankton production. species is primarily a plankton feeder. The stomachs of the marine sampl contained mainly protozoa, crustacea, molluscan larvae and a considera amount of detritus while the stomachs of the estuarine fish contained mai phytoplankton, protozoa, sand grains and organic detritus. Th observations have been discussed in relation to other reports populations occurring along the West African coast.

82-002535 Brown, L. R. and P. B. Moyle. THE IMPACT OF SQUAWFISH SALMONID POPULATIONS: A REVIEW. *N. Am. J. Fish. Manage.* 1(2):104-111. 1 SFA 27(4)
[Wildl. Fish. Biol., Univ. Calif., Davis 95616]

82-002536 Courtois, R.; M. Simoneau and J. J. Dodson. INTERACTI MULTISPÉCIFIQUES: RÉPARTITION SPATIO-TEMPORELLE DES LARVES DE CAP (*MALLOTUS VILLOSUS*), D'ÉPERLAN (*OSMERUS MORDAX*) ET DE HARENG L'ATLANTIQUE (*CLUPEA HARENGUS HARENGUS*) AU SEIN DE LA COMMUN PLANCTONIQUE DE L'ESTUAIRE MOYEN DU SAINT-LAURENT. [MULTISPEC INTERACTIONS: SPATIAL AND TEMPORAL ORGANIZATION OF LARVAL CAPELAN (*MALLO VILLOSUS*), SMELT (*OSMERUS MORDAX*) AND ATLANTIC HERRING (*CLUPEA HARE HARENGUS*) IN THE PLANKTONIC COMMUNITY OF THE MIDDLE ESTUARY OF THE S LAWRENCE.] *Can. J. Fish. Aquatic Sci.*

## FOODS/FEEDING (CONTINUED)

82-002536 CONTINUED 39(8):1164-1174. Aug. 1982. In French with English summ. SFA 27(4)
[Dep. Biol., Univ. Laval, City Univ., Ste-Foy, PQ G1K 7P4, Canada]

82-002537 Cyrus, D. P. and S. J. M. Blaber. MOUTHPART STRUCTURE AND FUNCTION AND THE FEEDING MECHANISMS OF *GERRES* (TELEOSTEI). *S. Afr. J. Zool.* 17(3):117-121. 1982. In English with Afrikaans summ. SFA 27(4)
[Dep. Zool., Univ. Natal, Pietermaritzburg, South Africa]

82-002538 Danker, S. A. A FOOD HABIT STUDY OF THE SPOTTED SEATROUT, *CYNOSCION NEBULOSUS* CUVIER AND VALENCIENNES, IN MISSISSIPPI SOUND AND ADJACENT AREAS. *MS thesis, Miss. State Univ.* 45p. 1979. From Miss. State Univ. Library Pub. No. 19. p. 370-371. 1981. Abstract only. SFA 27(4)
A total of 569 spotted seatrout were collected from Mississippi Sound and adjacent areas during the period of March, 1977 to June, 1978. Sixty-two% (352) of the specimens collected had food materials in their stomachs while 38% (217) of them had empty stomachs. The main food items consumed by spotted seatrout were fish and shrimp. Shrimp alone were found in 31% of the stomachs examined. Fish alone were found in 41% of the stomachs examined indicating that the spotted seatrout is a preferential feeder. Fish were found to be the most common food organism in the stomachs of spotted seatrout in this area. Spotted seatrout showed definite preferences for certain groups of food organisms which were most abundant and easiest to obtain. Variations in diet due to size were determined by dividing specimens into four classes: I (0-80mm TL), II (81-150mm TL), III (151-300mm TL), and IV (301-643mm TL). The four size classes were analysed by seasons of the year: Quarter I (spring), II (summer), III (fall), and IV (winter).

82-002539 Devadoss, P. and P. K. M. Pillai. OBSERVATIONS ON THE FOOD AND FEEDING HABITS OF THE EEL, *MURAENESOX CINEREUS* (FORSKAL) FROM PORTO NOVO. *Indian J. Fish.* 26(1-2):244-247. 1979. SFA 27(4)
[Cent. Mar. Fish. Res. Inst., Mangalore, India] Feeding in *Muraenesox cinereus* was studied from the catches of hooks and line fishing operations from the catamarans. This fish is a carnivore and largely piscivorous, feeding on the pelagic, demersal and bottom living organisms. Cannibalistic tendency is noticed. Pelagic fishes like the mackerel and the clupeids are found mostly preferred.

2-002540 Devadoss, P. ON THE FOOD OF RAYS, *DASYATIS UARNAK* (FORSKAL), *D. LCOCKII* (ANNANDALE) AND *D. SEPHEN* (FORSKAL). *Indian J. Fish.* 25(1-2):9-13. 978. SFA 27(4)
Observations on the food of three sting rays, *Dasyatis uarnak, D. alcockii* nd *D. sephen* were made separately. *D. uarnak* was observed to feed oraciously of both pelagic and benthic organisms. All the three are arnivores, feeding chiefly on fishes, crustaceans, molluscs and olychaetes.

2-002541 Frank, K. T. and W. C. Leggett. COASTAL WATER MASS REPLACEMENT: TS EFFECT ON ZOOPLANKTON DYNAMICS AND THE PREDATOR-PREY COMPLEX ASSOCIATED ITH LARVAL CAPELIN (*MALLOTUS VILLOSUS*). *Can. J. Fish. Aquatic Sci.* 9(7):991-1003. July 1982. In English with French summ. SFA 27(4)
[Dep. Biol., McGill Univ., Montreal, PQ H3A 1B1, Canada]

2-002542 Garman, G. C. IDENTIFICATION OF INGESTED PREY FISH BASED ON CALE CHARACTERISTICS. *N. Am. J. Fish. Manage.* 2(2):201-203. 1982. SFA 7(4)
[Me. Coop. Fish. Res. Unit, 313 Murray Hall, Univ. Me., Orono 04469]

FOODS/FEEDING (CONTINUED)

82-002543 Harada, K. THE ATTRACTIVE EFFECT OF FOOD BASED ON THE BEHAVIO RESPONSES OF JUVENILE YELLOWTAIL *SERIOLA QUINQUERADIATA*. *Bull. Jpn. So Sci. Fish.* 48(8):1047-1054. Aug. 1982. SFA 27(4)
[Lab. Biochem., Dep. Food Sci. Technol., Shimonoseki Univ. Fis Shimonoseki 759-65, Japan]

82-002544 Hudd, R. FEEDING OF BALTIC HERRING LARVAE (*CLUPEA HARENGUS* L. IN THE GULF OF FINLAND. *Finn. Fish. Res.* 4:27-34. 1982. SFA 27(4)
[Finn. Game Fish. Res. Inst., Fish. Div., Vaasa Field Stn., Rantakatu 2 SF-65120 Vaasa 12, Finland]

82-002545 Hyslop, E. J. THE FEEDING HABITS OF 0+ STONE LOACH, *NOEMACHEIL BARBATULUS* (L.), AND BULLHEAD, *COTTUS GOBIO* L. *J. Fish Biol.* 21(2):187-19 Aug. 1982. SFA 27(4)
[Dep. Biol. Sci., Univ. Sokoto, Nigeria] The feeding habits of the 0+ ye class of two of the most common small fish species in the River Ouzel Milton Keynes, stone loach, *Noemacheilus barbatulus* (L.), and bullhea *Cottus gobio* L., are assessed throughout the first growing season compared. Despite similarities in the diets of the two species, differen in feeding behaviour and in morphology, especially in gape, may serve t reduce interspecific competition by partitioning of food resources.

82-002546 Imrie, D. M. G. and G. R. Daborn. FOOD OF SOME IMMATURE FISH O MINAS BASIN, BAY OF FUNDY. *Proc. N.S. Inst. Sci.* 31(2):149-153. June 198 In English with French summ. SFA 27(4)
[Dep. Biol., Acadia Univ., Wolfville, NS B0P 1X0, Canada] Stoma contents of juveniles of 11 species of fish collected in the southern bigh of Minas Basin were examined. Most species, including typicall planktivorous ones such as smelt (*Osmerus mordax*) and silversides (*Menidi menidia*), exhibited broad food spectra having both planktonic (copepods meroplankton) and benthic (amphipods, isopods, cumaceans, and sedenta polychaetes) components. Only the blackspotted stickleback (Gasterost wheatlandi) was primarily planktivorous. The amphipod *Corophium volutat* appears to be a major food item for many juvenile fish in this region Minas Basin. At times saltmarsh insects were also of considerab importance. The lack of feeding specialization may result from t extensive tidal fluctuations that stir up organisms from the benthos wash out arthropods from nearby salt-marshes.

82-002547 Johnston, D. D. and D. J. Wildlish. EFFECT OF SUSPENDED SEDI ON FEEDING BY LARVAL HERRING (*CLUPEA HARENGUS HARENGUS* L.). *Bull. Envir Contam. Toxicol.* 29(3):261-267. Sept. 1982. SFA 27(4)
[Fish. Environ. Sci., Dep. Fish. Oceans, Biol. Stn., St. Andrews, NB 2X0, Canada]

82-002548 Kentouri, M. and P. Divanach. COMPORTEMENT ET RÉGIME ALIMENTA DES LARVES DE MARBRÉ *LITHOGNATHUS MORNYRUS* (POISSON, TÉLÉOST., SPARID ÉLEVÉES DANS DES CONDITIONS DE CHOIX TROPHIQUE POLYSECIFIQUE PLURIDIMENSIONNEL. [BEHAVIOUR AND PREY SELECTION OF STRIPED SEA B *LITHOGNATHUS MORNYRUS* LARVAE REARED IN POLYSPECIFIC AND PLURIDIMENSIO FOOD CONDITIONS.] *C. R. Hebd. Seances Acad. Sci. Ser. III Sci.* 294(17):859-861. 10 May 1982. In French with English summ. SFA 27(4)
[Stn. Biol. Mar. Lagunaire, 34200 Sète, France] When having a wide choic striped sea bream larvae select successively 4 type of preys: ciliata veligers (2.9-3.5 mm), rotifers (4-7 mm), small pelagic crustacea up to Digestibility of each prey class is very different.

FOODS/FEEDING (CONTINUED)

82-002548 CONTINUED Veligers, barnacles cypris and the rotifer *Cephalodella* remain alive in the gut.

82-002549 Kilambi, R. V. and A. Zdinak. FOOD INTAKE AND GROWTH OF HYBRID CARP (FEMALE GRASS CARP, *CTENOPHARYNGODON IDELLA* x MALE BIGHEAD, *ARISTICHTHYS (HYPOPHTHALMICHTHYS) NOBILIS*) FED ON ZOOPLANKTON AND *CHARA*. *J. Fish Biol.* 21(1):63-67. July 1982. SFA 27(4)
[Dep. Zool., Univ. Ark., Fayetteville 72701] Hybrid carp were raised in 1651 indoor tanks. Two tanks were used in this study each stocked with five fish (average total length and weight = 235.7 mm; 116.1 g); one tank was provided with zooplankton and the other with zooplankton and *Chara* sp. The hybrids fed actively on zooplankton at an average daily rate of 39% and *Chara* at 2.6% by body weight. Growth was estimated at 0.36% (0.43 g) per day. The hybrids on the two food types showed no significant differences either in plankton consumption or growth rate.

82-002550 Kohler, C. C. and J. J. Ney. A COMPARISON OF METHODS FOR QUANTITATIVE ANALYSIS OF FEEDING SELECTION OF FISHES. *Environ. Biol. Fishes* 7(4):363-368. 15 Sept. 1982. SFA 27(4)
[Fish. Res. Lab., South Ill. Univ., Carbondale 62901] Predator-prey data were obtained in a study of feeding ecology of land-locked alewife, *Alosa pseudoharengus*, in Claytor Lake, Virginia, and subjected to two indices of electivity as well as a nonparametric paired-comparisons statistical test. Values obtained from the two indices were often contradictory with each other and the statistical test. Attributes of the statistical procedure render it more appropriate than electivity indices to describe feeding selectivity in fish populations. Results of the study also demonstrated the importance of considering the size composition of zooplankton populations in prey preference studies; measures of selection were often positive for zooplankters ≥1.0 mm while negative for those of the same prey group <1.0 mm length. Because numerous problems are inherent with in situ feeding selectivity studies of planktivorous fishes, selectivity determinations, regardless of methodology, should be construed in a relative rather than bsolute context.

2-002551 Kurian, A. INDEX OF RELATIVE IMPORTANCE - A NEW METHOD FOR SSESSING THE FOOD HABITS OF FISHES. *Indian J. Fish.* 24(1-2):217-219. 1977. FA 27(4)

2-002552 Langeland, A. INTERACTIONS BETWEEN ZOOPLANKTON AND FISH IN A ERTILIZED LAKE. *Holarctic Ecol.* 5(3):273-310. Sept. 1982. SFA 27(4)
[Univ. Trondheim Mus., N-7000 Trondheim, Norway] The effects of fish redation on the zooplankton community in an oligotrophic lake, Langvatn, ear Trondheim in Central Norway, were investigated during a six-year eriod (1973-1978), together with the added effects of changes produced by dding artificial fertilizer in 1975 and 1976. The improved nutrient onditions in 1975 resulted in a rapid increase in biomass and production of he largest herbivore zooplankton species and of the fish population. A hange in the behaviour and food habits of the arctic char was recorded; hey became more pelagic and fed mainly on zooplankton. An increased urvival rate of 0-group and biomass of planktivorous fish in 1975 enhanced he degree of fish predation on the zooplankton during subsequent years 1976-1978). As a consequence of fish predation, the composition of the ooplankton changed, from a mainly large-sized to a mainly small-sized mmunity, dominated by *Bosmina longirostris* and rotifers. Since fish redation is size-selective and visibility-dependent, it induced a decrease mean size and in body length at onset of maturity of the cladoceran pulations and probably also weakened their ability to produce resting gs.

FOODS/FEEDING (CONTINUED)

82-002553 Lazarus, S. OBSERVATIONS ON THE FOOD AND FEEDING HABITS *SARDINELLA GIBBOSA* FROM VIZHINJAM. *Indian J. Fish.* 24(1-2):107-112. 197 SFA 27(4)

82-002554 Magnhagen, C. and A. Wiederholm. HABITAT AND FOOD PREFERENCES *POMATOSCHISTUS MINUTUS* AND *P. MICROPS* (GOBIIDAE) WHEN ALONE AND TOGETH AN EXPERIMENTAL STUDY. *Oikos* 39(2):152-156. Aug. 1982. In English wi Russian summ. SFA 27(4)

[Dep. Zool., Uppsala Univ., Box 561, S-751 22 Uppsala, Sweden] Two close related fish species, *Pomatoschistus minutus* (Pallas) and *P. micro* (Krøyer), live sympatrically on some shallow bottoms along the Swedi coast. Field samples showed that *P. minutus* was found in both the open vegetated habitat while *P. microps* occurred mostly in open areas. In kinds of laboratory experiments, in which the fish were offered a choice habitat only and a choice of a combination of habitat and food, we examin if and how these species segregate. We found that *P. minutus* chose the habitat types in equal proportions and was not influenced by the presence *P. microps*. It ate of both prey items but seemed to prefer chironomid lar to amphipods. On the other hand, *P. microps*, preferred the vegetated habit and always took most of its food in that habitat. Food consumption ra were the same when each species was alone and when both were together. certain amount of segregation thus occurs in sympatry because one of species retreats into a subset of its entire niche, but there is nothi like complete segregation.

82-002555 Mallatt, J. PUMPING RATES AND PARTICLE RETENTION EFFICIENCIES THE LARVAL LAMPREY, AN UNUSUAL SUSPENSION FEEDER. *Biol. Bull. (Woods Hol* 163(1):197-210. Aug. 1982. SFA 27(4)

[Dep. Zool., Wash. State Univ., Pullman 99164] The suspension feedi larvae of lampreys (ammocoetes) inhabit fine-grained sediments wh particulate organic matter is concentrated, but whose low permeabili limits the rate at which ammocoetes can pump water (flow rate). This st determined: 1) flow rates through the pharynges of ammocoetes, both wit and out of the sediment, and 2) the ability of ammocoetes to filt particles from suspension (retention efficiency) over a wide range of al cell concentrations (*Chlorella pyrenoidosa*, 1-75 mg/l). For most suspensi feeders, flow rate and retention efficiency must be measured indirect (clearance method). Direct measurement was possible here, as ammocoet remain apparently undisturbed in glass tubes that allow the separation inhalent from exhalent ventilatory currents. Problems arise in attempti to use clearance methods to determine flow rates in burrowed suspensi feeders, and these problems are discussed. Ammocoete flow rates exceptionally low compared to the rates of other suspension feeders, retention efficiency was consistently high, even at the highest al concentrations employed ($\bar{x}$=82%). While most suspension feeders rapid process dilute suspensions, ammocoetes meet nutrient needs by slo processing concentrated suspensions.

82-002556 Marrin, D. L. and D. C. Erman. EVIDENCE AGAINST COMPETIT BETWEEN TROUT AND NONGAME FISHES IN STAMPEDE RESERVOIR, CALIFORNIA. *N. J. Fish. Manage.* 2(3):262-269. 1982. SFA 27(4)

[Dep. Hydrol. Water Resour., Univ. Ariz., Tuscon 85721]

82-002557 Mason, C. F. and S. M. MacDonald. THE IMPUT OF TERREST INVERTEBRATES FROM TREE CANOPIES TO A STREAM. *Freshwater Biol.* 12(4):3 311. Aug. 1982. SFA 27(4)

[Dep. Biol., Univ. Essex, Wivenhoe Park, Colchester CO4 3SQ, England] input of terrestrial invertebrates from different tree canopies to a tr stream was determined for a 28-week period from April to October, 1980.

FOODS/FEEDING (CONTINUED)

82-002557 CONTINUED Sycamore produced the greatest number of animals, followed by oak and alder. Ash was not significantly different from the controls. Coleoptera, Diptera, Homoptera and Arachnida made up the greatest number of animals caught, with Lepidoptera larvae important beneath oak. The input of biomass (gm$^{-2}$ dry wt) was also greatest beneath sycamore (35.80), followed by oak (27.76), alder (20.39), ash (11.15) and control (9.92). The input of biomass was bimodal. The significance of terrestrial invertebrates as food for salmonids is discussed.

82-002558 Mauchline, J. THE PREDATION OF MYSIDS BY FISH OF THE ROCKALL TROUGH, NORTHEASTERN ATLANTIC OCEAN. *Hydrobiologia* 93(1-2):85-99. 6 Aug. 1982. SFA 27(4)
[Dunstaffnage Mar. Res. Lab., P.O. Box No. 3, Oban, Argyll, Scotland] The stomach contents of representatives of approximately 100 species of pelagic and demersal fish caught in the Rockall Trough, northeastern Atlantic Ocean, have been examined for the occurrence of mysids. More than 40 species of fish included mysids in their diets. The majority of the 21 species of mysids identified in the stomachs live in close association with the sediment and are rarely caught in pelagic nets. Mysids contributed significantly to the diets of many demersal fish but were not apparently important constituents of the food of pelagic fish.

82-002559 Mojumder, P. and S. S. Dan. STUDIES ON FOOD AND FEEDING HABITS OF CATFISH *TACHYSURUS TENUISPINIS* (DAY). *Indian J. Fish.* 26(1-2):115-124. 1979. SFA 27(4)
[Waltair Res. Cent., Cent. Mar. Fish. Res. Inst., Waltair, India] It is observed that 37% of the food of *Tachysurus tenuispinis*, consists of crabs, prawns, *Squilla* sp. and crustacean remains; 26% polychaetes, 6.5% molluscs, 6.3% teleosts, 4.2% ophiuroids and the rest miscellaneous food items. *T. tenuispinis* is, therefore, a carnivorous bottom feeder. As a single food item, polychaetes are most preferred. The fluctuations in the intensity of feeding (points) and the volume of stomach contents (ml) in different months generally showed similar trends both in the small (less than 27.5 cm total length) and large (more than 27.5 cm total length) catfish. The relative importance of various food items during different months shows that feeding is selective.

2-002560 Nair, K. V. S. FOOD AND FEEDING HABITS OF *OTOLITHES RUBER* (SCHNEIDER) AT CALICUT. *Indian J. Fish.* 26(1-2):133-139. 1979. SFA 27(4)
[Calicut Res. Cent., Cent. Mar. Fish. Res. Inst., Calicut, India]

2-002561 Nesterov, A. A. THE FEEDING OF *SCOMBRESOX SAURUS* (SCOMBERESOCIDAE) AND ITS TROPHIC RELATIONSHIPS IN THE EPIPELAGIC ZONE OF HE OCEAN. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 21(2):55-69. 1981. SFA 27(4)
[AtlantNIRO, Kalinigrad, USSR]

2-002562 Oijen, M. J. P. van. ECOLOGICAL DIFFERENTIATION AMONG THE PISCIVOROUS HAPLOCHROMINE CICHLIDS OF LAKE VICTORIA (EAST AFRICA). *Neth. J. ool.* 32(3):336-363. 1982. SFA 27(4)
[Rijksmus. Nat. Hist., P.O. Box 9517, 2300 RA, Leiden, Netherlands]

## FOODS/FEEDING (CONTINUED)

82-002563 Peterson, R. H. and D. J. Martin-Robichaud. FOOD HABITS FISHES IN TEN NEW BRUNSWICK LAKES. *Can. Tech. Rep. Fish. Aquatic Sci.* 1094. iii + 43p. Apr. 1982. In English with French summ. SFA 27(4)
[Biol. Stn., St. Andrews, NB E0G 2X0, Canada] The analyses of the stomac contents of 23 species of fish from 10 N.B. lakes are presented, usin percent occurrence and relative volumetric importance as parameters. Fis food habits were arrayed in a vector diagram such that food habits a related to trophic level. White suckers, banded killifish, ninespin sticklebacks, and juveniles of white perch and pumpkinseeds, ate mainly dipteran larvae and zooplankton. Brown bullheads, pumpkinseed, white perch, golden shiners, common shiners, and juvenile yellow perch ate dipter larvae and larger aquatic invertebrates. Fallfish, creek chub, and lak chub relied primarily on larger aquatic insects. Brook trout, yellow perch, and smallmouth bass ate larger aquatic insects and fish. Chain pickerel fe on fish. Fish communities in the lakes are discussed with reference to wat chemistry and susceptibility to potential lake acidification.

82-002564 Pirozhnikov, P. L. ZOOPLANKTON AND THE FEEDING OF PLANKTIVORO FISHES. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 21(1):54-64. 1981. S 27(4)
[GosNIORKh, Leningrad, USSR]

82-002565 Schmitt, R. J. and S. W. Strand. COOPERATIVE FORAGING YELLOWTAIL, *SERIOLA LALANDEI* (CARANGIDAE), ON TWO SPECIES OF FISH PRE *Copeia* 1982(3):714-717. 10 Aug. 1982. SFA 27(4)
[Dep. Biol. Sci., Univ. Calif., Santa Barbara 93106]

82-002566 Schreiber, D. C. and W. L. Minckley. FEEDING INTERRELATIONS NATIVE FISHES IN A SONORAN DESERT STREAM. *Great Basin Nat.* 41(4):409-426. Dec. 1981. SFA 27(4)
[Okla. Water Resour. Bd., Oklahoma City 73105] Native fishes in Aravai Creek, Arizona, cropped foods proportional to abundance of those foo within the system. Ephemeropteran nymphs and adults comprised the maj prey of 5 to 7 fishes (*Gila robusta, Meda fulgida, Rhinichthys osculu Tiaroga cobitis,* and *Catostomus insignis*). The omnivorous *Agos chrysogaster* ate almost as many nymphal mayflies as did the carnivor *Pantosteus clarki* was herbivorous, taking animals only when they we abundant. When ephemeropterans decreased in abundance, a shift by some fi species occurred to other locally or seasonally abundant items. Oth fishes continued to feed upon the same foods throughout the year. Abundan of invertebrates in Aravaipa Creek, coupled with marked spati partitioning of habitat by fishes present, seemingly precluded seve interspecific interactions for food.

82-002567 Smagula, C. M. and I. R. Adelman. DAY-TO-DAY VARIATION IN F CONSUMPTION BY LARGEMOUTH BASS. *Trans. Am. Fish. Soc.* 111(5):543-548. Sep 1982. SFA 27(4)
[I. R. Adelman: Dep. Entomol. Fish. Wildl., Univ. Minn., St. Paul 55108]

82-002568 Steimle, F. W., Jr. and L. Ogren. FOOD OF FISH COLLECTED ARTIFICIAL REEFS IN THE NEW YORK BIGHT AND OFF CHARLESTON, SOUTH CAROLI *Mar. Fish. Rev.* 44(6-7):49-52. June-July 1982. SFA 27(4)
[NMFS, Sandy Hook Lab., Highlands, NJ 07732] The construction artificial reefs is a popular means of countering increasing recreatio fishing pressure. Despite their popularity, many questions persist ab their function and effectiveness as a mangement tool. This paper discu the role of the epifauna, which developes on artificial reefs and most ot submerged hard surfaces, in providing food for the fish population found

FOODS/FEEDING (CONTINUED)

82-002568 CONTINUED or near artificial reefs. The stomach contents of 309 specimens of 13 species of fish, collected by spear or hook and line at three artificial reef sites, were examined to better define their trophic dependence on reef epifauna. Although most examined species did not appear to be highly dependent on the reef epifauna for food, there is a need for further study.

82-002569 Thorman, S. NICHE DYNAMICS AND RESOURCE PARTITIONING IN A FISH GUILD INHABITING A SHALLOW ESTUARY ON THE SWEDISH WEST COAST. *Oikos* 39(1):32-39. June 1982. In English with Russian summ. SFA 27(4)
[Dep. Zool., Univ. Uppsala, P.O. Box 561, S-75122, Uppsala, Sweden]

82-002570 Wallace, R. K., Jr. DIET OVERLAP AMONG INLAND SILVERSIDE (*MENIDIA BERYLLINA*), YOUNG-OF-THE-YEAR LARGEMOUTH BASS (*MICROPTERUS SALMOIDES*) AND JUVENILE BLUEGILL (*LEPOMIS MACROCHIRUS*). *Ph.D. dissertation, Auburn Univ.* 82p. 1982. From Diss. Abstr. Int. B Sci. Eng. 43(1):37. July 1982. SFA 27(4)
Inland silverside were found to be unsuitable for introduction as a prey species because of potential competition with largemouth bass for bluegill fry as well as for other food categories. Inland silverside also have the potential to reduce already established bluegill populations through food competition and predation.--From abstr.

82-002571 Weinstein, M. P.; K. L. Heck, Jr.; P. E. Giebel and J. E. Gates. THE ROLE OF HERBIVORY IN PINFISH (*LAGODON RHOMBOIDES*): A PRELIMINARY INVESTIGATION. *Bull. Mar. Sci.* 32(3):791-795. July 1982. SFA 27(4)
[Dep. Biol., Va. Commonwealth Univ., Richmond 23284]

82-002572 Wellington, G. M. DEPTH ZONATION OF CORALS IN THE GULF OF PANAMA: CONTROL AND FACILITATION BY RESIDENT REEF FISHES. *Ecol. Monogr.* 52(3):223-241. Sept. 1982. SFA 27(4)
[Mar. Sci. Inst., Univ. Calif., Santa Barbara 93106]

82-002573 Wright, D. I. and W. J. O'Brien. DIFFERENTIAL LOCATION OF *CHAOBORUS* LARVAE AND DAPHNIA BY FISH: THE IMPORTANCE OF MOTION AND VISIBLE SIZE. *Am. Midl. Nat.* 108(1):68-73. July 1982. SFA 27(4)
[Limnol. Res. Cent., 220 Pillsbury Hall, Univ. Minn., Minneapolis 55455]
The distance at which white crappie (*Pomoxis annularis*) could locate *Chaoborus* larvae (*C. americanus* and *C. punctipennis*) and *Daphnia magna* was measured. This "reactive distance" increased as a linear function of prey size for both prey types. Prey motion more than doubled the maximum distance at which *Chaoborus* larvae could be located. Significant reactive distance changes also occurred as the orientation of *Chaoborus* to the predator varied. The reactive distance to body-length relations of *Chaoborus* and *D. magna* differed and indicated that *Chaoborus* were less visible than *Daphnia*.

2-002574 Yáñez-Arancibia, A. and G. Díaz-González. ECOLOGÍA ROFODINÁMICA DE *DORMITATOR LATIFRONS* (RICHARDSON) EN NUEVE LAGUNAS OSTERAS DEL PACÍFICO DE MÉXICO. (PISCES: ELEOTRIDAE). [TROPHIC-DYNAMIC COLOGY OF *DORMITATOR LATIFRONS* (RICHARDSON) IN NINE COASTAL LAGOONS ON THE ACIFIC COAST OF MÉXICO. (PISCES: ELEOTRIDAE).] An. Cent. Cienc. Mar. imnol. Univ. Nac. Auton. Mex. 4(1):125-140. 1977. In Spanish with English umm. SFA 27(4)
[Cent. Cienc. Mar. Limnol., Univ. Nac. Auton. Mex., Cuidad Univ., Mexico , D.F.]

FOODS/FEEDING (CONTINUED)

82-002575 Yap, Y. S. and J. I. Furtado. THE FEEDING ECOLOGY OF *CYCLOCHEILICHTHYS* APOGON VALENCIENNES (CYPRINIDAE) IN SUBANG RESERVOIR, MALAYSIA. *Trop. Ecol.* 22(2):194-203. 1981. SFA 27(4)
[Dep. Zool., Univ. Malaya, Kuala Lumpur, Malaysia]

## AGE AND GROWTH

82-002576 Allen, J. R. M. and R. J. Wootton. AGE, GROWTH AND RATE OF FOOD CONSUMPTION IN AN UPLAND POPULATION OF THE THREE-SPINED STICKLEBACK, *GASTEROSTEUS ACULEATUS* L. *J. Fish Biol.* 21(1):95-105. July 1982. SFA 27(4)
[Dep. Zool., Univ. Coll. Wales, Aberystwyth, Dyfed, Wales] In a population of *Gasterosteus aculeatus* living in an infertile, upland lake, the fish bred at the age of one year and few survived to breed again. The highest growth rates were achieved in the first month of life, but in comparison with other populations of *G. aculeatus* growth was slow during the autumn and ceased during the winter. But in spring and early summer, there was a spurt in the growth rate. Laboratory studies provided regression models for the prediction of the rate of food consumption from measurements of growth. The estimates of the consumption rate indicated the effect of the growth in body size and seasonal variations during the first year of life. It was estimated that a fish of mean length in the population consumed 315 mg of food in a year in which it grew from 65.8 to 552.0 mg, with an overall gross growth effciency of 15.4%. The study illustrated the integration of laboratory and field studies to obtain reasonable estimates of the rate of food consumption by fish throughout their first year of life.

82-002577 Appukuttan, K. K.; P. N. Radhakrishnan Nair and K. K. Kunhikoya. STUDIES ON THE FISHERY AND GROWTH RATE OF OCEANIC SKIPJACK *KATSUWONUS PELAMIS* (LINNAEUS) AT MINICOY ISLAND FROM 1966 TO 1969. *Indian J. Fish* 24(1-2):33-47. 1977. SFA 27(4)

82-002578 Campana, S. E. and J. D. Neilson. DAILY GROWTH INCREMENTS IN OTOLITHS OF STARRY FLOUNDER (*PLATICHTHYS STELLATUS*) AND THE INFLUENCE OF SOME ENVIRONMENTAL VARIABLES IN THEIR PRODUCTION. *Can. J. Fish. Aquatic Sci.* 39(7):937-942. July 1982. In English with French summ. SFA 27(4)
[Inst. Anim. Resour. Ecol., Univ. British Columbia, Vancouver, BC V 1W5, Canada]

82-002579 Chang, W. Y. B. A STATISTICAL METHOD FOR EVALUATING T REPRODUCIBILITY OF AGE DETERMINATION. *Can. J. Fish. Aquatic Sci* 39(8):1208-1210. Aug. 1982. In English with French summ. SFA 27(4)
[Great Lakes Res. Div., Univ. Mich., Ann Arbor 48109]

82-002580 Clay, D. and H. Clay. BACK-CALCULATED AGE AND GROWTH OF T CATFISH, *CLARIAS LAZERA*, IN ISRAEL. *Isr. J. Zool.* 30(1-2):16-21. 1981. S 27(4)
[Bedford Inst. Oceanogr., Dartmouth, NS B2Y 4A2, Canada] Age and growth o *Clarias lazera* from Israel (near 'En haMifraz) were back-calculated fr vertebrae using the direct proportion method. No sexual dichotomy was fo in growth. The von Bertalanffy growth equation for back-calculated length at-age was TL=338.38 $[1-e^{-0.028(t+1.33)}]$, ($n=154, r^2=0.97$). The growth ra for these fish falls within the range of the same genus from simil environments in the Middle East and Africa.

## AGE AND GROWTH (CONTINUED)

82-002581 Dan, S. S. and P. Mojumder. LENGTH-WEIGHT RELATIONSHIP IN CATFISH *TACHYSURUS TENUISPINIS* (DAY). *Indian J. Fish.* 25(1-2):23-28. 1978. SFA 27(4)

82-002582 De León, M. E. and A. Malkov. ESTUDIO PRELIMINAR DE LA EDAD Y CRECIMIENTO DEL *BERYX SPLENDENS*, LOWE DEL ATLÁNTICO CENTRO-OCCIDENTAL. [PRELIMINARY STUDIES ON THE AGE AND GROWTH OF *BERYX SPLENDENS*, LOWE OF THE WEST CENTRAL ATLANTIC.] Rev. Cubana Invest. Pesq. 4(4):62-73. 1979. In Spanish with English summ. SFA 27(4)
[Cent. Invest. Pesq., Miramar, Havana, Cuba]

82-002583 Dhulkhed, M. K. DETERMINATION OF MEAN LENGTH OF OILSARDINE AT DIFFERENT AGES BASED ON THE ANNUAL SIZE-FREQUENCY DISTRIBUTION. *Indian J. Fish.* 24(1-2):195-198. 1977. SFA 27(4)

82-002584 Dirin-Khalturin, D. K. CUASES OF SIZE-AGE DIFFERENCES IN YOUNG SALMON AND SPAWNERS (SALMONIDAE). *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 21(4):64-80. 1981. SFA 27(4)
[Zool. Inst., USSR Acad. Sci., Leningrad, USSR] Anaylsis of the size-weight indices and age of juveniles, smolts and adult salmon (family Salmonidae) in nature, reveals patterns of the direct and inverse relationship of these parameters during the two main periods of life. Frequently, the original cause of the differences investigated proves to be the temperature regime in the reproductive waters, reflected in other features of the environment, and also feeding conditions. The basic variability in the weight and age of young salmon and spawner-migrants casts doubt on the notion of a uniform environment for uncubation of eggs and larvae and overwintering of young, particularly in regard to cold-water species. The results of an analysis of the natural variability of salmon have significance for their culture.

82-002585 Foucher, R. P. and D. Fournier. DERIVATION OF PACIFIC COD AGE COMPOSITION USING LENGTH-FREQUENCY ANALYSIS. *N. Am. J. Fish. Manage.* 2(3):276-284. 1982. SFA 27(4)
[Dep. Fish. Oceans, Resour. Serv. Br., Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada]

82-002586 Frie, R. V. MEASUREMENT OF FISH SCALES AND BACK-CALCULATION OF BODY LENGTHS USING A DIGITIZING PAD AND MICROCOMPUTER. *Fisheries (Bull. Am. Fish. Soc.)* 7(5):5-8. Sept.-Oct. 1982. SFA 27(4)
[Dep. Entomol. Fish. Wildl., Univ. Minn., 219 Hodson Hall, 1980 Folwell Ave., St. Paul 55108]

82-002587 Gjøsæter, H. and S. Tilseth. PRIMARY GROWTH INCREMENTS IN OTOLITHS OF COD LARVAE (*GADUS MORHUA* L.) OF THE ARCTO-NORWEGIAN COD STOCK. *Fiskeridir. Skr. Ser. Havunders.* 17(7):287-295. 1982. SFA 27(4)
[Inst. Mar. Res., Dir. Fish., Bergen, Norway]

82-002588 Guzmán-Arroyo, M.; J. L. Rojas-Galaviz and F. Vera-Herrera. CRECIMIENTO Y ASPECTOS POBLACIONALES DE LA LOBINA NEGRA *MICROPTERUS SALMOIDES* LACÉPÈDE EN EL LAGO DE CAMÉCUARO MICHOACÁN (PISCES: CENTRARCHIDAE). [GROWTH AND OTHER POPULATION ASPECTS OF *MICROPTERUS SALMOIDES* LACÉPÈDE IN THE LAKE OF CAMECUARO MICHOACÁN. (PISCES: CENTRARCHIDAE).] *An. Cent. Cienc.*

## AGE AND GROWTH (CONTINUED)

**82-002588** CONTINUED *Mar. Limnol. Univ. Nac. Auton. Mex.* 6(1):53-68. 1979. SFA 27(4)

[Lab. Limnol. Acuicult., Univ. Nac. Auton. Mex., Mexico D.F.] In December 1971 a sample of largemouth black bass *Micropterus salmoides* Lacépede was collected from Camecuaro Lake, State of Michoacan. On the basis of the biometric data, graphs of distribution of frequencies for standard length and total weight were made. The relation established between length and weight was: log. W=6.0252-3.5572 log. L y W=.000000943 $L^{3.5572}$. By means of analysis the age and annual growth were determined. Each ring was compared with fish length and the following relation was determined: Lp=3.752711 L∞- 3.544307; determining the composition of size for each age group. In order to develop the Von Bertalanffy model the constants e-K=$e^{-.5631}$ were obtained; maximum theoretical standard length L∞=358.4 mm; maximum theoretical total weight $W\infty^{33}$=1151.3 g; average theoretical time of growth commencement $T_0$=-0.803. With the data cited above the growth curve was fitted in the following manner: total weight Wt=1151.3 [I-e$^{-.5631(T+_{0.803})}$], standard length Lp=358.4 [I-e$^{-.5631(T+_{0.803})}$]$^{3.55}$. With the values obtained from the curve the instantaneous growth rate and the specific growth rhythm for length and weight were calculated. Also, the instantaneous survival rate (S=.2, $e^{-Z}$=$e^{-1.609}$) and the instantaneous mortality rate (Z=1.609.) were determined. The maximum growth rate was registered between 2 and 3 years of age. The condition factor (K) was calculated for the values observed and theorically in relation to sex and age. The use of Q (mulitple of 10) is proposed as a constant in order to facilitate the calculation of the condition factor and the instantaneous increment rate.

**82-002589** Harmin, S. A. THE INFLUENCE OF SELECTED WATER QUALITY PARAMETERS ON THE GROWTH OF FISH IN TOBACCO JUICE CREEK. *MS thesis, Miss. State Univ.* 39p. 1979. From Miss. State Univ. Library Publ. No. 19. p. 375. 1981. Abstract only. SFA 27(4)

The physico-chemical parameters of a small warm-water stream were investigated over a period of ten months. Water parameters investigated were dissolved oxygen, water temperature, total alkalinity, carbon dioxide, pH and turbidity. Total alkalinity was higher in summer than in winter. A mark-recapture study for evaluation of the growth of several fish species were made. Length and weight gain were regressed on water quality parameters. Simple linear regression was used for this purpose. Dissolved oxygen and water temperature were significantly ($\alpha$=0.05) correlated with fish growth. Total alkalinity, carbon dioxide, pH and turbidity were not significantly ($\alpha$-0.05) correlated with fish growth. In general, fish growth was poor. The nature of the stream was partially responsible for its low productivity as was exemplified by physico-chemical parameters of the stream. Critical values of dissolved oxygen occurred in summer and early fall. Dissolved oxygen probably affected the growth of fish during the time.

**82-002590** Jobling, M. FOOD AND GROWTH RELATIONSHIPS OF THE COD, *GADUS MORHUA* L., WITH SPECIAL REFERENCE TO BALSFJORDEN, NORTH NORWAY. *J. Fish Biol.* 21(4):357-371. Oct. 1982. SFA 27(4)

[Inst. Fiskerifag, Univ. Tromsø, 9001 Tromsø, Norway] Rates of food consumption are notoriously difficult to measure under field conditions and indirect methods must be used. Using data for cod collected from three different areas (North Sea, Faroes & Balsfjorden), food consumption was estimated from stomach fullness and rates of gastric evacuation. These estimates were then compared with estimates given by analysis of food-growth relationships. Although estimates were of the same order of magnitude there were differences. These differences were suggested to be largely due to insufficient knowledge relating to feeding rhythms of wil fish and lack of

82-002590 CONTINUED data regarding the 'costs of reproduction'. Differences between the annual energy budgets of cod from the three stocks are discussed.

82-002591 Krishnamurthy, K. N. and M. Kaliyamurthy. STUDIES ON THE AGE AND GROWTH OF SANDWHITING *SILLAGO SIHANA* (FORSKAL) FROM PULICAT LAKE WITH OBSERVATIONS ON ITS BIOLOGY AND FISHERY. *Indian J. Fish.* 25(1-2):84-97. 1978. SFA 27(4)

82-002592 Laroche, J. L.; S. L. Richardson and A. A. Rosenberg. AGE AND GROWTH OF A PLEURONECTID, *PAROPHRYS VETULUS*, DURING THE PELAGIC LARVAL PERIOD IN OREGON COASTAL WATERS. *NOAA Fish. Bull.* 80(1):93-104. Jan. 1982. SFA 27(4)

[Gulf Coast Res. Lab., East Beach Dr., Ocean Springs, MS 39564] The age of 331 field-collected English sole, *Parophrys vetulus*, larvae, 3.1-20.0 mm SL, was determined using daily otolith growth increments. Age in days from hatching was estimated by adding 5, the number of days prior to first increment formation in the laboratory, to the number of increments counted on sagittae. Number of otolith growth increments among larvae of known age in the laboratory ranged widely. Yet daily periodicity of increment formation in *P. vetulus* was inferred from the observations that even under poor growing conditions some larvae added one increment each day since first formation and that, unlike the remaining laboratory-reared larvae in which no pattern was evident, increment addition among larvae in the sea appeared to follow a stable and uniform pattern. Gompertz and von Bertalanffy growth models fitted the resultant size-at-age data equally well; therefore, only the Gompertz model is presented. Larval growth rate decreased from 0.3 mm per day at 8-9 days of age to <0.1 mm per day between 73 and 74 days. The oldest specimen was 74 days old, but most of the larval and transforming specimens collected in plankton samples were <70 days old. Previous estimates of age at length of larval *P. vetulus*, based on length-frequency modal progresion analysis, overestimated the age of larvae >5.5 mm SL by 2-3 times and, correspondingly, the duration of pelagic life was overestimated, 18-20 weeks compared to 8-10 weeks based on otolith-estimated age.

82-002593 Mel'nikov, Y. S. SIZE-AGE COMPOSITION AND GROWTH PATTERN OF *ALLOCYTTUS VERRUCOSUS* (OREOSOMATIDAE). *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 21(2):178-184. 1981. SFA 27(4)
[AzCherNIRO, Kerch, USSR]

82-002594 Mojumder, P. LENGTH-FREQUENCY STUDIES ON CATFISH *TACHYSURUS THALASSINUS* AT WALTAIR DURING 1964-1970. *Indian J. Fish.* 24(1-2):90-95. 1977. SFA 27(4)

Determination of age and growth of the catfish *Tachysurus thalassinus* (Ruppell) has been attempted employing length-frequency method, during the years 1964-65 to 69-70. The fish is found to attain an average length of 18 cm at the end of its first year, 35 cm at the end of 2nd year and 42 cm at the end of 3rd year. The fishery along the Visakhapatnam coast is supported mainly by those which have completed one year. The spawning season starts around April and continues up till July or August, and the young-ones start entering the fishery from November-December.

82-002595 Neilson, J. D. and G. H. Geen. OTOLITHS OF CHINOOK SALMON (*ONCORHYNCHUS TSHAWYTSCHA*): DAILY GROWTH INCREMENTS AND FACTORS INFLUENCING THEIR PRODUCTION. *Can. J. Fish. Aquatic Sci.*

AGE AND GROWTH (CONTINUED)

82-002595 CONTINUED 39(10):1340-1347. Oct. 1982. In English with Fre summ. SFA 27(4)
[Dep. Biol. Sci., Simon Fraser Univ., Burnaby, BC V5A 1S6, Canada]

82-002596 Penczak, T.; M. Zalewski; E. Suszycka and M. Molińsk ESTIMATION OF THE DENSITY, BIOMASS AND GROWTH RATE OF FISH POPULATIONS TWO SMALL LOWLAND RIVERS. *Ekol. Pol.* 29(2):233-255. 1982. In English wi Polish summ. SFA 27(4)
[Dep. Comp. Anat. Anim. Ecol., Inst. Environ. Biol., Univ. Lodz, Banac 12/16,90-237 Lodz, Poland]

82-002597 Prasad, S.; D. P. Sinha; A. K. Chanchal and B. N. Pandey. BIOMETRIC STUDY OF SOME ASPECTS OF THE BIOLOGY OF *MACROGNATHUS ACULEATU* (PISCES: MASTACEMBELIDAE). *An. Cent. Cienc. Mar. Limnol. Univ. Nac. Auto Mex.* 6(2):59-66. 1979. In English with Spanish summ. SFA 27(4)
[Magadh Univ., Dep. Zool., Bodh Gaya 824234, Bihar, India]

82-002598 Quinn, S. P. and M. R. Ross. ANNULUS FORMATION BY WHITE SUCKE AND THE RELIABILITY OF PECTORAL FIN RAYS FOR AGEING THEM. *N. Am. J. Fis Manage.* 2(2):204-208. 1982. SFA 27(4)
[Dep. For. Wildl. Manage., Univ. Mass., Amherst 01003]

82-002599 Rengaswamy, V. S. STUDIES ON LENGTH FREQUENCY OF OILSARDINE A CALICUT DURING 1970-71 TO 73-74. *Indian J. Fish.* 24(1-2):69-75. 1977. S 27(4)

82-002600 Reynolds, L. F. and R. Moore. GROWTH RATES OF BARRAMUNDI, *LAT CALCARIFER* (BLOCH), IN PAPUA NEW GUINEA. *Aust. J. Mar. Freshwater Res.* 33(4):663-670. 1982. SFA 27(4)
[New South Wales State Fish., P.O. Box N211, Grosvenor St., Sydney, N.S.W. 2000, Australia] Growth rates of *L. calcarifer* in western Papua wer determined using modal progression in length-frequency samples and analysi of increases in lengths of tagged fish. Growth was rapid, the Vo Bertalanffy parameters being $K$=0.128, $L_{\infty}$=138 cm and $t_0$=-1.12 years. Th length-weight relationships was $W$=0.0106$l^{3.02}$, were $W$ is weight measured i grams and $l$ is length measured in centimetres.

82-002601 Rosenberg, A. A. and J. L. Laroche. GROWTH DURING METAMORPHOSIS OF ENGLISH SOLE, *PAROPHRYS VETULUS*. *NOAA Fish. Bull.* 80(1):150-153. Jan. 1982. SFA 27(4)
[Dep. Oceanogr., Dalhousie Univ., Halifax, NS B3H 3J5, Canada]

82-002602 Ross, J. L. and G. R. Huntsman. AGE, GROWTH, AND MORTALITY OF BLUELINE TILEFISH FROM NORTH CAROLINA AND SOUTH CAROLINA. *Trans. Am. Fish. Soc.* 111(5):585-592. Sept. 1982. SFA 27(4)
[N.C. Div. Mar. Fish., Monteo 27954]

82-002603 Rubec, P. J. and S. U. Qadri. COMPARATIVE AGE, GROWTH, AN CONDITION OF BROWN BULLHEAD, *ICTALURUS NEBULOSUS*, IN SECTIONS OF THE OTTAW RIVER, CANADA. *Can. Field-Nat.* 96(1):6-18. Jan.-Mar. 1982. SFA

## AGE AND GROWTH (CONTINUED)

82-002603 CONTINUED 27(4)

[Biol. Sci. Cent., Boston Univ., Boston, MA 02215] The abundance, age, growth and condition of six populations of Brown Bullhead, *Ictalurus nebulosus* from the three sections of the Ottawa River have been compared. Gill netting indicated bullheads were more abundant below industrial and municipal effluents. The species was most abundant and formed a larger percentage of the catch of all species below Hawkesbury. Significantly slower growth and poorer condition of brown bullhead were found at stations in the lotic lower river section, below Ottawa, were wood-fiber blankets much of the substrate. Better growth and condition of bullheads occurred in the lake-like Hawkesbury and upper river sections where wood-fiber is scarce or absent. Growth in length appeared related to physical conditions applicable to an entire section of river, rather than to localized factors at stations below industrial and municipal effluents. Previous age and growth estimates from pectoral spines have generally underestimated age by one year and hence seriously overestimated growth at "age I".

82-002604 Saleh, U. B. DEVELOPMENT OF SIZE RANKING IN SIBLING CHANNEL CATFISH FINGERLINGS. *MS thesis, Miss. State Univ.* 54p. 1979. From Miss. State Univ. Library Publ. No. 19. p. 379-380. 1981. Abstract only. SFA 27(4)

A total of 3600 sibling channel catfish fry (*Ictalurus punctatus*) in 12 equally divided groups were used to determine the development of size ranking in 4 different size of channel catfish. The sex ratio of channel catfish was found to be 1 to 1. More males than females were present in high class size. Sex ratios of 1 to 0.85, 1 to 0.93, 1 to 1.12 and 1 to 0.85 were obtained for size class 1 (15 cm and above), size class 2(13.5 to 14.9 cm), size class 3(12.0 to 13.4 cm) and size class 4(less than 12.0 cm) respectively. While sex ratios of branded fish (size class 1) were 1 to 1.35, 1 to 0.43 and 1 to 0.77 for groups A, B and C respectively. Sex ratio between and within the groups of branded fish were significantly different ($P\leq0.01$). After the fish were grown for 180 days (second phase) the groups remained discrete with no overlapping either in length or weight. Growth rates of males and females were significantly different ($P\leq0.01$). It was found that male channel catfish fingerlings grow faster than female. Males were the heaviest individuals in population. Stress conditions created in the tanks caused low survival rate (24.08 percent) of a week-old fry at the end of phase 1 (125 days) of growing period.

82-002605 Seshappa, G. SOME OBSERVATIONS ON THE SIZE DISTRIBUTION AND THE OCCURRENCE OF GROWTH RINGS IN THE SCALES OF THREE SPECIES OF *CYNOGLOSSUS* AT CALICUT. *Indian J. Fish.* 25(1-2):188-196. 1978. SFA 27(4)

82-002606 Shubina, L. I. GROWTH AND SEXUAL MATURATION OF THE CASPIAN SHAD, *ALOSA CASPIA CASPIA*. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 21(2):98-108. 1981. SFA 27(4)

[KaspNIRKh, Astrakhan, USSR] Patterns of population growth rates in the Caspian shad, *Alosa caspia caspia*, are given and also the growth of individual year-classes. A decrease in the rate of growth and an acceleration in the sexual maturation of the shad have been noted in recent years; the reasons for these phenomena are discussed.

82-002607 Sonina, M. A. GROWTH RATE AND SEXUAL MATURATION OF THE HADDOCK, *MELANOGRAMMUS AEGLEFINUS*. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 21(2):85-97. 1981. SFA 27(4)

[PINRO, Murmansk, USSR] The growth rate of haddock, *Melanogrammus aeglefinus*, of different year-classes and during 1930-1937, 1952-1964, 1965-1978 was studied. With improvement in food supply, growth rates of the

## AGE AND GROWTH (CONTINUED)

82-002607 CONTINUED Barents Sea haddock gradually increased from the 1930's to the 1970's. As a result sexual maturation was speeded up between the 1950's and the 1970's, leading to rejuvenation of the population.

82-002608 Sukhanov, V. V. THE RELATIONSHIP BETWEEN FEEDING CONDITIONS AND GROWTH VARIABILITY IN ANIMALS. *J. Ichthyol.* (*Engl. Transl. Vopr. Ikhtiol.*) 21(2):70-74. 1981. SFA 27(4)
[Pac. Inst. Geogr., Far East Sci. Cent., USSR Acad. Sci., Vladivostok, USSR]

82-002609 Victor, A. C. C. LENGTH-WEIGHT RELATIONSHIP IN THE MALABAR SOLE, *CYNOGLOSSUS MACROSTOMUS* NORMAN. *Indian J. Fish.* 25(1-2):259-262. 1978. SFA 27(4)

82-002610 Wilson, K. H. and P. A. Larkin. RELATIONSHIP BETWEEN THICKNESS OF DAILY GROWTH INCREMENTS IN SAGITTAE AND CHANGE IN BODY WEIGHT OF SOCKEYE SALMON (*ONCORHYNCHUS NERKA*) FRY. *Can. J. Fish. Aquatic Sci.* 39(10):1335-1339. Oct. 1982. In English with French summ. SFA 27(4)
[Inst. Anim. Resour. Ecol., Univ. British Columbia, Vancouver, BC V6T 1W5, Canada]

82-002611 Yohannan, T. M. THE GROWTH PATTERN OF INDIAN MACKEREL. *Indian J. Fish.* 26(1-2):207-216. 1979. SFA 27(4)
[Calicut Res. Cent., C.M.F.R. Inst., Calicut, India]

## GEOGRAPHICAL DISTRIBUTION, FISH SURVEYS, ETC.

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[Cent. Cienc. Mar. Limnol., Univ. Nac. Auton. Mex., Cuidad Univ., Mexico 20, D.F.]

82-002613 Amezcua-Linares, F. and A. Yáñez-Arancibia. ECOLOGÍA DE LOS SISTEMAS FLUVIO-LAGUNARES ASOCIADOS A LA LAGUNA DE TÉRMINOS. EL HABITAT Y ESTRUCTURA DE LAS COMUNIDADES DE PECES. [ECOLOGY OF FLUVIAL-LAGOON SYSTEMS ASSOCIATED TO TERMINOS LAGOON. THE HABITAT AND FISH COMMUNITY STRUCTURE.] *An. Cent. Cienc. Mar. Limnol. Univ. Nac. Auton. Mex.* 7(1):69-118. 1980. In Spanish with English summ. SFA 27(4)
[Cienc. Mar. Limnol., Univ. Nac. Auton. Mex., Ciudad Univ., Mexico 20, D.F.]

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82-002616 Bravo-Núñez, E. and A. Yáñez-Arancibia. ECOLOGÍA EN LA BOCA DE PUERTO REAL, LAGUNA DE TÉRMINOS I. DESCRIPCIÓN DEL ÁREA Y ANÁLISIS ESTRUCTURAL DE LAS COMUNIDADES DE PECES. [ECOLOGY IN THE ENTRANCE OF PUERTO REAL, TÉMINGOS LAGOON. I. DESCRIPTION OF THE AREA AND STRUCTURAL ANALYSIS OF FISH COMMUNITIES.] *An. Cent. Cienc. Mar. Limnol. Univ. Nac. Auton. Mex.* 6(1):125-182. 1979. SFA 27(4)
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[Ichthyological Assoc., Inc., 100 South Cass St., Middletown, DE 19709]

82-002618 Brunson, K. LITTLE FISH. *Kans. Wildl.* 39(4):11-22. July-Aug. 1982. SFA 27(4)

82-002619 Bullock, L. H. and M. F. Godcharles. RANGE EXTENSIONS FOR FOUR SEA BASSES (PISCES: SERRANIDAE) FROM THE EASTERN GULF OF MEXICO WITH A COLOR NOTE ON *HEMANTHIAS LEPTUS* (GINSBURG). *Northeast Gulf Sci.* 5(2):53-56. July 1982. SFA 27(4)
[Mar. Res. Lab., 100 Eighth Ave., SE, St. Petersburg, FL 33701]

82-002620 Dumont, P. DISPERSION POST-GLACIAIRE DEL L'OMBLE CHEVALIER D'EAU DOUCE (*SALVELINUS ALPINUS*) DANS LE QUÉBEC MÉRIDIONAL. [POST-GLACIAL DISPERSION OF THE ARCTIC CHARR (*SALVELINUS ALPINUS*) IN SOUTHERN QUEBEC.] *Nat. Can. (Que.)* 109(2):229-234. Sept. 1982. In French with English summ. SFA 27(4)
[Serv. Amenage. Exploitation Faune, Minist. Loisir, Chas. Pêche Que., 13 rue Buteau, Hull, PQ J8Z IV4, Canada] The known distribution of arctic charr in southern Québec is limited to less than a hundred lakes; most of them are of small area. These populations are probably vestiges of the anadromous populations which lived in the Champlain sea and the Atlantic ocean, approximately 11,900 years ago. Their dispersion would have taken place during the first phases of the marine invasion that followed the retreat of the glaciers. Ecological factors (changes in the environment, interspecific competition) have contributed to the restriction of its distribution. Because of human intervention (introduction of competing species, pollution), the species can be considered marginal in its existence or even completely eradicated in many of the water bodies where its presence had once been recorded.

82-002621 Eckmayer, W. J. FIRST GULF OF MEXICO RECORD OF *ZU CRISTATUS* (BONNELLI) (PISCES: TRACHYPTERIDAE). *Northeast Gulf Sci.* 5(2):51-52. July 1982. SFA 27(4)
[Ala. Mar. Resour. Lab., P.O. Box 189, Dauphin Island 36528]

82-002622 Fallo, G. J. and M. L. Warren, Jr. DISTRIBUTION AND HABITAT OF *ETHEOSTOMA ATRIPINNE* IN KENTUCKY. *Trans. Ky. Acad. Sci.* 43(3-4):131-136. Sept. 1982. SFA 27(4)

## GEOGRAPHICAL DISTRIBUTION, FISH SURVEYS, ETC. (CONTINUED)

82-002622 CONTINUED
[Ky. Nat. Preserves Comm., Frankfort 40601] Recent collecting efforts and examination of museum material resulted in a reassessment of the distribution of *Etheostoma atripinne* in Kentucky and contributed to the understanding of its habitat preferences. The range of *E. atripinne* as now defined is continuous from Fishing Creek, Pulaski County, Kentucky, downstream in the Cumberland River of Tennessee to Little River, Trigg County, Kentucky. *Etheostoma atripinne* was taken primarily from cobble-pebble riffles in streams ranging from third to fifth order. Gradients ranged from 0.7-3.2 m/km with velocities of 0.098-0.690 m/s. Water quality analyses indicated that *E. atripinne* inhabits well-buffered, hardwater streams with little or no siltation.

82-002623 Flores-Coto, C. and J. Alvárez. Cadena. ESTUDIOS PRELIMINARES DE DISTRIBUCIÓN Y ABUNDANCIA DEL ICTIOPLANCTON EN LA LAGUNA DE TÉRMINOS, CAMPECHE. [PRELIMINARY STUDIES ON ABUNDANCE AND DISTRIBUTION OF ICHTHYOPLANKTON IN TERMINOS LAGOON, CAMPECHE.] *An. Cent. Cienc. Mar. Limnol. Univ. Nac. Auton. Mex.* 7(2):67-78. 1980. In Spanish with English summ. SFA 27(4)
[Cent. Cienc. Mar. Limnol., Univ. Nac. Auton. Mex., Ciudad Univ., Mexico 20, D.F.]

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[Ark. Game Fish Comm., 2 Nat. Resour. Dr., Little Rock 72205]

82-002625 Getter, C. D. TEMPERATURE LIMITATIONS TO THE DISTRIBUTION OF MANGROVE MOSQUITOFISH IN FLORIDA. *Fla. Sci.* 45(3):196-200. 1982. SFA 27(4)
[Res. Plan. Inst., Inc., 925 Gervais St., Columbia, SC 29201] An extensive survey of southern Florida revealed a limited, coastal distribution of the mangrove mosquitofish (*Gambusia rhizophorae*). However, discovery of the species in collections from Cuban fresh waters indicates that it is not salinity-limited. Laboratory studies determined the low-temperature tolerance of the species to be 17°C. The winter, low-temperature isotherm for southern Florida at this temperature intersects all furthest-known points north and west of the species' distribution. Temperature limitations to distribution may be controlled by fertility which, for the mangrove mosquitofish, is known to be correlated with temperature.

82-002626 Gibson, D. W. RANGE EXTENSION OF THE THREESPINE STICKLEBACK, *GASTEROSTEUS ACULEATUS*, TO MANITOULIN ISLAND, ONTARIO. *Can. Field-Nat.* 96(1):86. Jan.-Mar. 1982. SFA 27(4)
[186 Front St., L'Original, ON K0B 1K0, Canada]

82-002627 Gilhen, J. and D. E. McAllister. FIRST CANADIAN RECORD OF YELLOWFIN BASS, *ANTHIAS NICHOLSI* FIRTH, TAKEN OFF NOVA SCOTIA. *Proc. N.S. Inst. Sci.* 31(3-4):251-254. June 1982. SFA 27(4)
[N.S. Mus. 1747 Summer St., Halifax, NS B3H 3A6, Canada]

82-002628 Heald, D. I. and M. H. Walker. 'TAIYO MARU 71' DEMERSAL TRAWLING CRUISE IN WESTERN AUSTRALIAN COASTAL WATERS SOUTH OF 21° S, JULY-SEPTEMBER, 1979. *West. Aust. Dep. Fish. Wildl. Rep.* No. 51. 104p. 1982. SFA 27(4)

## GEOGRAPHICAL DISTRIBUTION, FISH SURVEYS, ETC. (CONTINUED)

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[West. Aust. Mar. Res. Lab., P.O. Box 20, North Beach, Western Australia 6020, Australia]

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[Dep. Zool., Panjab Univ., Chandigarh, India] The paper describes a dichotomous key for the fishes of Punjab. As many as 114 species and 4 subspecies have been identified.

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82-002632 Kepner, W. G. AQUATIC INVENTORY OF THE BILL WILLIAMS AND HASSAYAMPA DRAINAGES, MARICOPA, YAVAPAI, AND YUMA COUNTIES, ARIZONA. *U.S. Dep. Interior Bur. Land Manage. Tech. Note* No. 354. 65p. 1980. Available from U.S. Bur. Land Manage., Denver Serv. Cent., Fed. Bldg. 50, Denver, CO 80225. SFA 27(4)

82-002633 Kirka, A.; J. Mészáros; Š. Nagy and F. Šporka. PODMIENKY A VÝSKYT RÝB V RIEKE TOPLE. [CONDITIONS AND OCCURRENCE OF FISHES IN THE RIVER TOPLA.] *Biologia (Bratisl.)* 37(6):653-658. 1982. In Czech with Russian and English summ. SFA 27(4)
[Lab. Rybárstva Hydrobiol., Drieňová 3, 826 24 Bratislava, Czechoslovakia]

82-002634 Krishna Pillai, S. and A. A. Jayaprakash. OCCURRENCE OF JUVENILES OF THE INDIAN MACKEREL *RASTRELLIGER KANAGURTA* (CUVIER) IN BOMBAY WATERS. *Indian J. Fish.* 25(1-2):257-259. 1978. SFA 27(4)

82-002635 Kulkarni, G. M. and T. S. Balasubramanian. ON THE OCCURRENCE OF THE DEEPSEA SNAKE FISH, *ACANTHOCEPOLA LIMBATA* (CUVIER) (PISCES: CEPOLIDAE) IN KARWAR WATERS. *Indian J. Fish.* 25(1-2):243-252. 1978. SFA 27(4)

82-002636 Linder, A. D. *PTYCHOCHEILUS* (SQUAWFISH) FROM PLEISTOCENE AMERICAN FALLS LAKE. *J. Idaho Acad. Sci.* 17(2):51-54. Dec. 1981. SFA 27(4)
[Dep. Biol., Idaho State Univ., Pocatello 83201] A partial skeleton of a squawfish of the genus *Ptychocheilus* has been recovered from deposits of the Pleistocene (probably Sangamonian), contributing to the intriguing distribution pattern of the fishes of the upper Snake River in Idaho. This fossil casts some doubt on the hypothesis of Hubbs and Miller which accounts for the absence of downstream species in the upper river by proposing that

## GEOGRAPHICAL DISTRIBUTION, FISH SURVEYS, ETC. (CONTINUED)

82-002636 CONTINUED Miocene lava flows over wide areas of southern Idaho obliterated the upper Snake River fauna when or after the falls on the Snake River were formed.

82-002637 Mead, J. I.; R. S. Thompson and T. R. Van Devender. LATE WISCONSINAN AND HOLOCENE FAUNA FROM SMITH CREEK CANYON, SNAKE RANGE, NEVADA. *Trans. San Diego Soc. Nat. Hist.* 20(1):1-16. 6 Aug. 1982. SFA 27(4)
[Lab. Paleoenviron. Stud., Dep. Geosci., Univ. Ariz., Tucson 85721]

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[Fac. Fish. Mar. Sci., Univ. Pertanian Malaysia, Serdang, Selangor, Malaysia]

82-002639 Moyle, P. B.; J. J. Smith; R. A. Daniels; T. L. Taylor; D. G. Price and D. M. Baltz. DISTRIBUTION AND ECOLOGY OF STREAM FISHES OF THE SACRAMENTO-SAN JOAQUIN DRAINAGE SYSTEM, CALIFORNIA. *Univ. Calif. Publ. Zool.* 115:1-256. Jan. 1982. SFA 27(4)

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[INIDEP, Mar del Plata, Argentina]

82-002643 Pillai, S. K. and V. S. Somvanshi. A NEW RECORD OF THE GRUB FISH, *PARAPERCIS ALBOGUTTA* (GUNTHER) FROM BOMBAY WATERS. *Indian J. Fish.* 26(1-2):237-238. 1979. SFA 27(4)
[C.M.F.R.I. Res. Cent., Bombay, India]

82-002644 Pillai, S. K. ON OCCURRENCE OF MACKEREL, *RASTRELLIGER KANAGURTA* (CUVIER) IN DISTANT WATERS OFF BOMBAY. *Indian J. Fish.* 26(1-2):225-226. 1979. SFA 27(4)
[Bombay Res. Cent., C.M.F.R. Inst., Bombay, India]

82-002645 Sakai, H. and M. Sato. FIRST RECORDS OF FIVE TELEOSTEAN FISHES AND THREE SECOND RECORDS OF GOBIID FISHES FROM JAPAN, COLLECTED IN RIVERS OF THE RYUKYU ISLANDS. *Bull. Fac. Fish. Hokkaido Univ.* 33(2):79-88. June 1982. SFA 27(4)
[Lab. Embryol. Genet., Fac. Fish., Hokkaido Univ., Hokodate, Japan]

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82-002647 Sewell, S. A. PRELIMINARY REPORT ON THE FISHES OF THE UPPER SALINE RIVER, POLK AND HOWARD COUNTIES, ARKANSAS, AND OBSERVATIONS ON THEIR RELATIONSHIPS WITH LAND USE AND PHYSIOCHEMICAL CONDITIONS. *Proc. Ark. Acad. Sci.* 35:60-65. 1981. SFA 27(4)
[U.S. Soil Conserv. Serv., Water Resour. Staff, Nashville, TN 37203]

82-002648 Shefler, D. and A. Ben-Tuvia. THE OCCURENCE OF GIBEL-CARP GOLDFISH, *CARASSIUS AURATUS GIBELIO*, IN LAKE KINNERET (LAKE TIBERIAS). *Bamidgeh* 34(2):63-65. June 1982. SFA 27(4)
[Dep. Fish., P.O.B. 699, Haifa, Israel]

82-002649 Sokolovskiy, A. S. and T. G. Sokolovskaya. SPECIES COMPOSITION OF THE FAMILY ASTRONESTHIDAE (SALMONIFORMES) IN THE NORTH WEST PACIFIC. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 21(2):43-48. 1981. SFA 27(4)
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82-002651 Stevenson, D. K. A REVIEW OF THE MARINE RESOURCES OF THE WESTERN CENTRAL ATLANTIC FISHERIES COMMISSION (WECAFC) REGION. *FAO Fish. Tech. Pap.* No. 211. viii + 134p. 1981. SFA 27(4)
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82-002652 Stott, F. C. A NOTE ON CATCHES OF BASKING SHARKS, *CETORHINUS MAXIMUS* (GUNNERUS), OFF NORWAY AND THEIR RELATION TO POSSIBLE MIGRATION PATHS. *J. Fish Biol.* 21(2):227-230. Aug. 1982. SFA 27(4)
[Back of Beyond, Winter Hill, Cookham Dean, Berkshire SL6 9TW, U.K.]

82-002653 Tweddle, D. THE FISHES OF THE MALAŴI NORTHERN REGION GAME RESERVES. *Nyala* 7(2):99-108. 1981. SFA 27(4)
[Fish. Dep., P.O. Box 111, Karonga, Malawi]

82-002654 Vigg, S. SPECIES COMPOSITION AND RELATIVE ABUNDANCE OF ADULT FISH IN PYRAMID LAKE, NEVADA. *Great Basin Nat.* 41(4):395-408. 31 Dec. 1981. SFA 27(4)
[Bioresour. Cent., Desert Res. Inst., Reno, NV 89506] Pyramid Lake fish populations were sampled with nets on a monthly basis from November 1975 through December 1977. Fish species were taken in the following order of numerical relative abundance: tui chub (*Gila bicolor*), Tahoe sucker (*Catostomus tahoensis*), Lahontan cutthroat trout (*Salmo clarki henshawi*) including cutthroat-rainbow hybrids, cui-ui (*Chasmistes cujus*), and Sacramento perch (*Archoplites interruptus*). Relative abundance estimates are discussed with respect to seasonal availability, spatial distribution of the fish, sampling bias of the fishing methods, and

## GEOGRAPHICAL DISTRIBUTION, FISH SURVEYS, ETC. (CONTINUED)

82-002654 CONTINUED biomass of the fish. Recent temporal trends in the population structure of the lake are presented.

82-002655 Walker, M. H.; S. J. Blight and G. M. Cliff. FEASIBILITY TRAWLING ACTIVITIES IN THE GREAT AUSTRALIAN BIGHT BY THE KOREAN TRAWLERS DONG BAND 91 AND DONG WON 509 DURING THE PERIOD 15.11.79 to 12.1.80. *West. Aust. Dep. Fish. Wildl. Rep.* No. 50. 59p. 1982. SFA 27(4)
[Dep. Fish Wildl., 108 Adelaide Terrace, Perth, Western Australia]

82-002656 Wooley, C. M.; P. A. Moon and E. J. Crateau. A LARVAL GULF OF MEXICO STURGEON (*ACIPENSER OXYRHYNCHUS DESOTOI*) FROM THE APALACHICOLA RIVER, FLORIDA. *Northeast Gulf Sci.* 5(2):57-58. July 1982. SFA 27(4)
[U.S. FWS, Off. Fish. Assistance, Panama City, FL 32405]

82-002657 Yáñez-Arancibia, A. TAXONOMÍA, ECOLOGÍA Y ESTRUCTURA DE LAS COMUNIDADES DE PECES EN LAGUNAS COSTERAS CON BOCAS EFÍMERAS DEL PACÍFICO DE MÉXICO. [TAXONOMY, ECOLOGY AND STRUCTURE OF FISH COMMUNITIES IN COASTAL LAGOONS WITH EPHEMERAL INLETS ON THE PACIFIC COAST OF MEXICO.] *Publ. Espec. Cent. Cienc. Mar. Limnol. Univ. Nac. Auton. Mex.* 2:1-306. 1978. In Spanish with English summ. SFA 27(4)
[Univ. Nac. Auton. Mex., Ciudad Univ., Mexico 20, D.F.]

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[Cent. Cienc. Mar. Limnol., Univ. Nac. Auton. Mex., Cuidad Univ., Mexico 20, D.F.]

## ABUNDANCE, FACTORS OF; SURVIVAL AND MORTALITY

82-002659 Becker, C. D.; D. A. Neitzel and D. H. Fickeisen. EFFECTS OF DEWATERING ON CHINOOK SALMON REDDS: TOLERANCE OF FOUR DEVELOPMENTAL PHASES TO DAILY DEWATERINGS. *Trans. Am. Fish. Soc.* 111(5):624-637. Sept. 1982. SFA 27(4)
[Environ. Sci. Dep., Pac. Northwest Lab., Richland, WA 99352]

82-002660 Gulland, J. A. WHY DO FISH NUMBERS VARY? *J. Theor. Behav.* 97(1):69-75. 7 July 1982. SFA 27(4)
[Dep. Fish., FAO, Rome, Italy]

82-002661 Healey, M. C. TIMING AND RELATIVE INTENSITY OF SIZE-SELECTIVE MORTALITY OF JUVENILE CHUM SALMON (*ONCORHYNCHUS KETA*) DURING EARLY SEA LIFE. *Can. J. Fish. Aquatic Sci.* 39(7):952-957. July 1982. In English with French summ. SFA 27(4)
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82-002662 Heufelder, G. R.; D. J. Jude and F. J. Tesar. EFFECTS OF UPWELLING ON LOCAL ABUNDANCE AND DISTRIBUTION OF LARVAL ALEWIFE (*ALOSA PSEUDOHARENGUS*) IN EASTERN LAKE MICHIGAN. *Can. J. Fish. Aquatic Sci.* 39(11):1531-1537. Nov. 1982. In English with French summ. SFA 27(4)
[Great Lakes Res. Div., Inst. Sci. Technol., Univ. Mich., Ann Arbor 48109]

82-002663 Marí, A. and R. Coyula. ACTUALIZACIÓN DE LA MORTALIDAD NATURAL DE LA MERLUZA PLATEADA EN LA PLATAFORMA DE NUEVA ESCOCIA. [ESTIMATES OF NATURAL MORTALITY OF SILVER HAKE IN NOVA SCOTIAN WATERS.] *Rev. Cubana Invest. Pesq.* 4(3):79-88. 1979. In Spanish with English summ. SFA 27(4)
[Cent. Invest. Pesq., Miramar, Havana, Cuba] Estimates of natural mortality rates for the Silver hake in Nova Scotian waters were made by means of various techniques. These estimates ranged from 0.23 to 0.69 with an average estimate of 0.44. If we disregard the value of 0.69, then the average would be 0.35, that is a very close figure to the value of 0.4 at present used when dealing with this resource.

82-002664 Maximenkov, V. V. [FOOD SUPPLY FOR HERRING LARVAE AND ITS RELATION TO THE NUMBERS OF GENERATIONS.] *Zool. Zh.* 61(8):1180-1187. Aug. 1982. In Russian with English summ. SFA 27(4)
[Kamchatka Div. Pac. Res. Inst. Fish. Oceanogr., Petropavlovsk-Kamchatsky, USSR] There exists an inverse relationship between the mortality of herring fry and the food supply for their larvae, and it can be expressed by an equation $Z=-a(\ln X+b)$, where $Z$ is mortality coefficient for fry, $X$ is food supply during transition to exogenous feeding; $a$ and $b$ are coefficients. Such a relationship was found for *Clupea harengus pallasi*, *Clupeonella delicatula* and *Engraulus encrasicholus*.

82-002665 Miglarese, J. V.; C. W. McMillan and M. H. Shealy, Jr. SEASONAL ABUNDANCE OF ATLANTIC CROAKER (*MICROPOGONIAS UNDULATUS*) IN RELATION TO BOTTOM SALINITY AND TEMPERATURE IN SOUTH CAROLINA ESTUARIES. *Estuaries* 5(3):216-223. Sept. 1982. SFA 27(4)
[Manage. Syst. Lab., VPI&SU, 617 N. Marst St., Blacksburg, VA 24061] During 1973 and 1974 seasonal abundance and mean total length of Atlantic croaker, *Micropogonias undulatus*, were investigated by otter trawl at 33 stations in South Carolina estuaries in relation to bottom salinity and temperature. Relative abundance of Atlantic croaker was measured by catch per unit effort at 3°C temperature intervals and $3^{o}$/oo salinity intervals. Croaker occurred over a bottom temperature range of 9.0-31.4°C while occurring most abundantly in waters above 24.0°C. No significant correlation between size and temperature was found. Croaker were collected in salinities from 0.4 to $34.4^{o}$/oo. High correlations of size and salinity were evident in 1973 during winter (r=0.79), summer (r=0.82), and fall (r=0.94). In 1974, correlations were significant only during fall (r=0.76).

82-002666 Moksness, E. FOOD UPTAKE, GROWTH AND SURVIVAL OF CAPELIN LARVAE (*MALLOTUS VILLOSUS* MÜLLER) IN AN OUTDOOR CONSTRUCTED BASIN. *Fiskeridir. Skr. Ser. Havunders.* 17(7):267-285. 1982. SFA 27(4)
[Stn. Biol. Stasjon Flødevigen 4800 Arendal, Norway]

82-002667 Serns, S. L. RELATION OF TEMPERATURE AND POPULATION DENSITY TO FIRST-YEAR RECRUITMENT AND GROWTH OF SMALLMOUTH BASS IN A WISCONSIN LAKE. *Trans. Am. Fish. Soc.* 111(5):570-574. Sept. 1982. SFA 27(4)
[Wis. Dep. Nat. Resour., Box 440, Woodruff 54568]

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the 27 *A. reinhardtii* collected from 30 sites in coastal rivers and lakes
Victoria, Australia, during 1975-78 were well below the Australi
statutory health limit (0.5 ug $g^{-1}$ wet weight). For *A. australis* the
mercury concentration was 0.17 ug $g^{-1}$ (±.16 s.d., range 0.01-1.60 ug $g^{-1}$
for *A. reinhardtii* the values were 0·37 ± 0.23 ug $g^{-1}$ (range 0.12-1.10 μg
$^{1}$). Statistical analyses showed that variation in mercury concentration
to total length accounted for only 13% of the total variation in
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significance of PCB concentration in the surface microlayer of
Michigan to contamination of lake trout was examined using a modificatio
a previously developed food chain model. Vertically migrating zooplank
were assumed to spend a fraction of each day exposed to a surface microl
with dissolved and phytoplankton PCB concentrations at values that resul
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[Camp Dresser & McKee Inc., Environ. Sci. Div., 11455 West 48th Ave., heat Ridge, CO 80033] Acid mine drainage from an abandoned mone has entered oal Creek, a small stream in western Colorado since about 1945. As a result f water quality degradation, the reach of Coal Creek extending from below he drainage outfall to its confluence with the Slate River (4.0 km istance) has been essentially devoid of aquatic life. Viable brook and rown trout populations exist above and below this section of stream. In 981, AMAX, Inc., a mining company with interests in developing an area djacent to Coal Creek, Commenced the operation of a heavy metals treatment lant designed to eradicate the water quality problems of the acid drainage. ithin one month following plant operation, aquatic invertebrates were bserved in the stream and within 2-3 months fish were recovered throughtou he stream reach. Since a barrier deters downstream fish migration into the eclaimed section of Coal Creek, the majority of fish found throughout the each probably originated in the Slate River. The reestablishment of fish in oal Creek has occurred rapidly attesting to the improved water quality and he resiliency and opportunistic nature of aquatic biota.

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82-002848 McWilliams, P. G. A COMPARISON OF PHYSIOLOGICAL CHARACTERISTICS IN NORMAL AND ACID EXPOSED POPULATIONS OF THE BROWN TROUT *SALMO TRUTTA*. *Comp. Biochem. Physiol. A Comp. Physiol.* 72(3):515-522. 1982. SFA 27(4)
[Dep. Biol. Sci., Univ. Lancaster, Bailrigg, Lancaster, LA1 4YQ, Lancashire, England] Ionoregulatory and erythrocytic characteristics are compared in two populations of the brown trout, *Salmo trutta*, one population from a naturally acid, low calcium environment (Galloway, Scotland) and the other from a neutral, high calcium environment (Cumbria, England). Some data from the acid resistant freshwater perch, *Perca fluviatilis*, is included for comparison. Sodium fluxes in the Galloway trout and in the perch are less sensitive to lowered environmental pH. In media containing similar calcium concentrations the Galloway trout exhibit a much reduced gill permeability to $H^+$ ions and a lower $Na^+$ permeability than the Cumbrian trout. The perch also shows similar permeability characteristics to the Galloway trout. Erythrocytic characteristics in trout from the naturally acid Galloway region suggest an increased ability to extract and transport oxygen in low pH media.

82-002849 Mensi, P.; A. Arillo; C. Margiocco and G. Schenone. LYSOSOMAL DAMAGE UNDER NITRITE INTOXICATION IN RAINBOW TROUT (*SALMO GAIRDNERI* RICH.). *Comp. Biochem. Physiol. C Comp. Pharmacol.* 73(1):161-165. 1982. SFA 27(4)
[Ist. Zool., Univ. Genova, Italy]

82-002850 Muramato, S. EFFECTS OF COMPLEXANS (DTPA, EDTA) ON THE TOXICITY OF LOW CONCENTRATIONS OF COPPER TO FISH. *J. Environ. Sci. Health A Environ. Sci. Eng. (Marcel Dekker, Inc., N.Y.)* 17(3):313-319. 1982. SFA 27(4)
[Inst. Agric. Biol. Sci., Okayama Univ., Kurashiki 710, Japan]

82-002851 Pohla-Gubo, G. and H. Adam. DER EINFLUB DES ANIONAKTIVEN TENSIDS NA-ALKYL-BENZOLSULFONAT (LAS) AUF DIE KOPF-EPIDERMIS JUVENILER REGENBOGENFORELLEN (*SALMO GAIRDNERI* RICHARDSON). [INFLUENCE OF THE ANIONACTIVE DETERGENT NA-ALKYL-BENZENESULPHONATE (LAS) ON THE HEAD-EPIDERMIS OF JUVENILE RAINBOW TROUT (*SALMO GAIRDNERI* RICHARDSON).] *Zool. Anz.* 209(1-2):97-110. 1982. In German with English summ. SFA 27(4)
[Zool. Inst., Univ. Salzburg, Austria]

## TOXICOLOGY; BIOASSAYS (CONTINUED)

82-002852 Roberts, M. H., Jr. and R. E. Bendl. ACUTE TOXICITY OF KEPONE TO SELECTED FRESHWATER FISHES. *Estuaries* 5(3):158-164. Sept. 1982. SFA 27(4)
[Va. Inst. Mar. Sci., Coll. William and Mary, Gloucester Point, VA 23062] The acute toxicity of Kepone in freshwater was determined with three fish species, *Ictalurus punctatus* (channel catfish), *Lepomis macrochirus* (bluegills), and *Anguilla rostrata* (American eel). Elvers of *A. rostrata* were most sensitive with a 96 h lethal concentration for 50% of the animals tested (LC50) of 35μg per l. Bluegills were slightly less sensitive with a 96h LC50 of 50μg per l. Catfish were most tolerant with a 96h LC50 of 514μg per l. Bluegills and catfish exposed to comparable concentrations of Kepone accumulated equivalent amounts in 96h. This observation in conjunction with the markedly different 96h LC50's for these species suggest a difference in the ways these fish cope with Kepone.

82-002853 Rombough, P. J. and E. T. Garside. CADMIUM TOXICITY AND ACCUMULATION IN EGGS AND ALEVINS OF ATLANTIC SALMON *SALMO SALAR*. *Can. J. Zool.* 60(8):2006-2014. Aug. 1982. In English with French summ. SFA 27(4)
[Pac. Biol. Stn., Dep. Fish. Oceans, Nanaimo, BC V9R 5K6, Canada]

82-002854 Sastry, K. V. and S. K. Sharma. ENDRIN INDUCED HEPATIC INJURY IN *CHANNA PUNCTATUS* (HAM.). *Indian J. Fish.* 26(1-2):250-253. 1979. SFA 27(4)
[Dep. Zool., D.A.V. Coll., Muzaffarnagar-251001, India] The effect of a sublethal concentration (0.01 mg/l) of endrin on the histological changes in the liver of a teleost fish, *Channa punctatus* (Ham.) has been studied. The degenerative changes included hypertrophy of hepatic cells and their nuclei, liver cord disarray, vacuolation of cytoplasm and necrosis. In some cells, the cell membrane was ruptured. The centrolobular area was highly necrosed. The liver on the whole showed distorted appearance.

82-002855 Saxena, A. B.; D. Subba Rao and Z. U. Khan. STUDIES ON THE ACUTE TOXICITIES OF COPPER, MERCURY, AND CADMIUM TO *DANIO MALABARICUS* AND *PUNTIUS TICTO*. *J. Environ. Sci. Health A Environ. Sci. Eng.* (*Marcel Dekker, Inc., N.Y.*) 17(5):657-665. 1982. SFA 27(4)
[Dep. Zool., Madhav Sci. Coll., Vikram Univ., Ujjain (M.P.) 456 010, India]

82-002856 Singh, N. N. and A. K. Srivastava. EFFECT OF FORMOTHION ON CARBOHYDRATE METABOLISM IN INDIAN CATFISH, *HETEROPNEUSTES FOSSILIS*. *Environ. Res.* 28(2):335-339. Aug. 1982. SFA 27(4)
[Dep. Zool., Univ. Gorakhpur 273 001, U.P., India] Exposure of Indian catfish (*Heteropneustes fossilis*) to 10.4 ppm formothion (0, 0-dimethyl-S(*N*-methyl-*N*-formoylcarbamoylmethyl) dithiophosphate) for 3, 6, 12, 48, and 96 hr caused depletion of muscle glycogen at 3, 6, and 48 hr and hepatic glycogenolysis at 6, 12, 48, and 96 hr; hyperglycemia developed at all time intervals. Both blood lactate and pyruvate concentrations registered significant increases between 3 and 96 hr. These results show that evaluation of carbohydrate metabolites may constitute a rapid method for assessment of pesticide toxicity.

82-002857 Stendahl, D. H. and J. B. Sprague. EFFECTS OF WATER HARDNESS AND pH ON VANADIUM LETHALITY TO RAINBOW TROUT. *Water Res.* 16(10):1479-1488. 1982. SFA 27(4)
[Water Resour., DIAND, P.O. Box 1500, Yellowknife, NWT X1A 2R3, Canada] Seven-day $LC_{50}$s of vanadium pentoxide for 2.5-g trout showed only a small range, from 1.9 to 6.0 mg V$l^{-1}$, in tests at all 12 combinations of 30, 100 and 355 mg $l^{-1}$ total hardness with pH 5.5, 6.6, 7.7 and 8.8. Toxicity decreased from low to high hardness by an average factor of 1.8, probably because of regulated vanadium intake at the gill membranes.

## TOXICOLOGY; BIOASSAYS (CONTINUED)

82-002857 CONTINUED Hardness did not exert a major effect, probably because vanadium is present in water as various anions and does not complex with carbonates and bicarbonates as do most metals which behave as cations. Toxicity was greatest at pH 7.7, and the predominating ion $H_2VO_4^-$ was apparently the most toxic one. $HVO_4^{2-}$ which prevailed at high pH, was calculated to be 60% as toxic as $H_2VO_4$. Toxicity decreased at pH 6.6 and 5.5, probably because much of the metal was then present as decavanadates, which were found to be half as toxic as $H_2VO_4^-$ on the basis of vanadium content. Small fish were more resistant to vanadium than larger ones, at least up to 12g wet wt. However cumulative mortality continued to increase until 2 weeks of exposure, and incipient lethal levels were probably much the same for fish of different size, at about 60-70% of the 7-d $LC_{50}$s stated in the paper. The toxicity of vanadium is similar to that of zinc except that it does not show a major change with water hardness.

82-002858 Sylvester, J. R. and L. E. Holland. INFLUENCE OF TEMPERATURE, WATER HARDNESS, AND STOCKING DENSITY ON MS-222 RESPONSE IN THREE SPECIES OF FISH. *Prog. Fish-Cult.* 44(3):138-141. July 1982. SFA 27(4)
[U.S. FWS, Natl. Fish. Res. Lab., P.O. Box 818, LaCrosse, WI 54601]

82-002859 Tandjung, S. D. THE ACUTE TOXICITY AND HISTOPATHOLOGY OF BROOK TROUT (*SALVELINUS FONTINALIS*, MITCHILL) EXPOSED TO ALUMINUM IN ACID WATER. *Ph.D. dissertation, Fordham Univ.* 330p. 1982. From Diss. Abstr. Int. B Sci. Eng. 43(3):619. Sept. 1982. SFA 27(4)

82-002860 Thomas, P. C. and T. L. Murthy. CHANGES IN FEW PISCINE ENZYMES DUE TO ENDRIN AND SEVIN TOXICOSIS. *Indian J. Fish.* 25(1-2):1-8. 1978. SFA 27(4)

82-002861 Varanasi, U.; M. Nishimoto; W. L. Reichert and J. E. Stein. METABOLISM AND SUBSEQUENT COVALENT BINDING OF BENZO[a]PYRENE TO MACROMOLECULES IN GONADS AND LIVER OF RIPE ENGLISH SOLE (*PAROPHRYS VETULUS*). *Xenobiotica* 12(7):417-425. July 1982. SFA 27(4)
[NMFS, 2725 Montlake Blvd. East, Seattle, WA 98112]

82-002862 Vuorinen, P. ACUTE TOXICITY OF THE SLIMECIDE FENNOSAN F 50 TO TWO SPECIES OF TROUT AND THE EFFECT OF ACETONE ON THE TOXICITY. *Finn. Fish. Res.* 4:62-68. 1982. SFA 27(4)
[Finn. Game Fish. Res. Inst., Fish. Div., Unioninkatu 45 B 42, SF-00170 Helsinki 17, Finland]

82-002863 Wagner, G. F. and B. A. McKeown. CHANGES IN PLASMA INSULIN AND CARBOHYDRATE METABOLISM OF ZINC-STRESSED RAINBOW TROUT, *SALMO GAIRDNERI*. *Can. J. Zool.* 60(9):2079-2084. Sept. 1982. In English with French summ. SFA 27(4)
[Dep. Biol. Sci., Simon Fraser Univ., Burnaby, BC V5A 1S6, Canada]

82-002864 Weis, P. and J. S. Weis. TOXICITY OF METHYLMERCURY, MERCURIC CHLORIDE, AND LEAD IN KILLFISH (*FUNDULUS HETEROCLITUS*) FROM SOUTHAMPTON, NEW YORK. *Environ. Res.* 28(2):364-374. Aug. 1982. SFA 27(4)
[Dep. Anat., Coll. Med. Dent., Newark, NJ 07103]

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82-002865 Woodhead, A. D. and P. C. Bryant. A NOTE ON THE DISTRIBUTION OF ECTOPIC THYROID TISSUE IN FIVE SPECIES OF POECILIID FISHES. *J. Fish Biol.* 21(1):59-62. July 1982. SFA 27(4)

[Biol. Dep., Brookhaven Natl. Lab., Upton, NY 11793] The intraperitoneal injection of polycyclic aromatic hydrocarbons in young Amazon mollies induces proliferation of ectopic thyroid tissue in the spleen. We have surveyed untreated mollies, *Poecilia formosa*, and four closely related poeciliid fishes to see if ectopic thyroid tissue occurs normally in the spleen. If this were the case, it is possible that the tissue may have been stimulated to proliferate by the injected compounds. We found no instances of ectopic thyroid at any site in 50 untreated Amazon mollies examined nor in some 50 spleens dissected from other untreated fish. Splenic thyroid tissue was found in five guppies from 50 surveyed, but did not occur in other species.

82-002866 Woodworth, J. and D. Pascoe.CADMIUM TOXICITY TO RAINBOW TROUT, *SALMO GAIRDNERI* RICHARDSON: A STUDY OF EGGS AND ALEVINS. *J. Fish Biol.* 21(2):47-57. July 1982. SFA 27(4)

[Dep. Appl. Biol., UWIST, King Edward VII Ave., Cardiff CF1 3NU, Wales]

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82-002867 Burress, R. M. EFFECTS OF SYNERGIZED ROTENONE ON NONTARGET ORGANISMS IN PONDS. *U.S. Fish Wildl. Serv. Invest. Fish Control* 91. 7p. 1982. SFA 27(4)

[U.S. Fish Wildl. Serv., Southeast. Fish Control Lab., P.O. Box 9, Warm Springs, GA 31830]

82-002868 Dawson, V. K.; J. B. Sills and C. W. Luhning. ACCUMULATION AND LOSS OF 2',5-DICHLORO-4'-NITROSALICYLANILIDE (BAYER 73) BY FISH: LABORATORY STUDIES. *U.S. Fish Wildl. Serv. Invest. Fish Control* 90. 5p. 1982. SFA 27(4)

[U.S. Fish Wildl. Serv., Natl. Fish. Res. Lab., P.O. Box 818, La Crosse, WI 54601]

82-002869 Gilderhus, P. A. EFFECTS OF AN AQUATIC PLANT AND SUSPENDED CLAY ON THE ACTIVITY OF FISH TOXICANTS. *N. Am. J. Fish. Manage.* 2(3):301-306. 1982. SFA 27(4)

[U.S. FWS, Natl. Fish. Res. Lab., P.O. Box 818, La Crosse, WI 54601]

82-002870 Serns, S. L. and M. H. Hoff. EFFECTS OF THE COMBINED USE OF TWO FISH TOXICANTS, ANTIMYCIN-A AND ROTENONE, ON THE ZOOPLANKTON OF A NORTHERN WISCONSIN BOG LAKE. *Wis. Dep. Nat. Resour. Res. Rep.* 120. 7p. Sept. 1982. SFA 27(4)

[Wis. Dep. Nat. Resour., Bur. Res., Woodruff] The influence of the combined application of 3.8µg/l a.i. of antimycin-A (Fintrol-5$^R$) on 13 May 1980, and 0.05 mg/l a.i. rotenone (2.0 mg/l Prentox-Synpren-Fish$^R$) on 21 May 1980, on the zooplankton of Spruce Lake, Wisconsin, was investigated. Samples collected before and after toxicant application indicated a drastic decrease in both copepods and cladocerans immediately after the application of antimycin. No copepods or cladocerans were collected until 18 July (none were found on 14 July) approximately 2 months after toxicant application. The major cladoceran species and cyclopoid copepods exhibited midsummer to early fall pulses during 1980. These pulses appeared to be somewhat delayed, however, when compared with pulses the following year (1981). Calanoid copepods did not rebound from the effects of the treatment until summer 1981, over one year after treatment.

## RESEARCH AND MANAGEMENT-GENERAL

82-002871 Brauhn, J. L. and H. Kincaid. SURVIVAL, GROWTH, AND CATCHABILITY OF RAINBOW TROUT OF FOUR STRAINS. *N. Am. J. Fish. Manage.* 2(1):1-10. 1982. SFA 27(4)
[Natl. Fish. Res. Dev. Lab., R.D. #4, Box 47A, Wellsboro, PA 16901]

82-002872 Connell, J. J. RECENT TRENDS IN FISH SCIENCE AND TECHNOLOGY. *Bull. Jpn. Soc. Sci. Fish.* 48(8):1029-1040. Aug. 1982. SFA 27(4)
[Torrey Res. Stn., Aberdeen, Scotland]

82-002873 Deriso, R. B. RELATIONSHIP OF FISHING MORTALITY TO NATURAL MORTALITY AND GROWTH AT THE LEVEL OF MAXIMUM SUSTAINABLE YIELD. *Can. J. Fish. Aquatic Sci.* 39(7):1054-1058. July 1982. In English with French sum. SFA 27(4)
[Int. Pac. Halibut Comm., P.O. Box 5009, University Station, Seattle, WA 98105]

82-002874 Dotson, T. MORTALITIES IN TROUT CAUSED BY GEAR TYPE AND ANGLER-INDUCED STRESS. *N. Am. J. Fish. Manage.* 2(1):60-65. 1982. SFA 27(4)
[Mont. Dep. Fish Wildl. Parks, Yellowstone River Trout Hatchery, Big Timber 59011]

82-002875 Eiserman, F. M. PERSPECTIVES ON FISHERY BIOLOGY IN THE PRIVATE SECTOR. *Proc. Annu. Meet. Colo.-Wyo. Chap. Am. Fish. Soc.* 17:195-203. 1982. Available @$10.00 from Mary McAfee, Colo. Div. Wildl., 711 Independent, Grand Junction, CO 81501. SFA 27(4)
[330 S. Center, #202, Casper, WY 82601]

82-002876 Johnson, D. L.; S. V. Emerson and S. W. Schwerzel. USING BIBLIOGRAPHIC INSTRUCTION TO IMPROVE RESEARCH PAPER QUALITY. *Fisheries (Bull. Am. Fish. Soc.)* 7(5):14-17. Sept.-Oct. 1982. SFA 27(4)
[2021 Coffey Rd., Columbus, OH 43210] As a result of poor quality term papers from inadequate bibliographic searches in an introductory fisheries management class we included bibliographic instruction on a experimental basis. Sixteen topics were selected from available library materials and each student chose from these a subject for a ten-page term paper. Librarians provided classroom lectures on the use of libraries and one hour of practical search strategy application. Two homework exercises ensured library familiarization. Students concurrently submitted library logs (diaries) recording search techniques used during the library search and comprehensive bibliographies on their chosen subjects. Four weeks later the term paper was due. This multifaceted approach produced papers dramatically improved over papers from four previous years. Concepts were more thoughtfully conceived and the literature more carefully integrated and evaluated than in years past. Significant increases were observed in number of references cited (1981 $\bar{x}$ = 12.7 vs. 1976-1979 $\bar{x}$ = 8.03), in the diversity of references used (1981 $\bar{x}$ = 3.09 vs 1976-1979 $\bar{x}$ = 2.67), and in the number of integrating statements per paper (1982 $\bar{x}$ = 6.76 vs 1976-1979 $\bar{x}$ = 1.62). Our experience indicates that comprehensive bibliographic training requires close coordination with librarians and some changes in course integrating and perhaps teaching philosophy. Ancillary rewards include more student time spent in libraries, more efficient use of librarian's teaching skills, and better evaluation and justification of increasing library holdings in specific areas.

## RESEARCH AND MANAGEMENT-GENERAL (CONTINUED)

82-002877 Johnson, J. E. and J. N. Rinne. THE ENDANGERED SPECIES ACT AND SOUTHWEST FISHES. *Fisheries (Bull. Am. Fish. Soc.)* 7(4):2-8. July-Aug. 1982. SFA 27(4)
[U.S. FWS, Off. Endangered Species, Albuquerque, NM]

82-002878 Kramer, B. M. LEGAL ASPECTS OF USE AND DEVELOPMENT OF WILDLIFE RESOURCES ON PRIVATE LANDS: COLORADO, KANSAS, NEW MEXICO, OKLAHOMA, TEXAS. *Great Plains Agric. Counc. Publ.* No. 103. ii + 70p. 1982. SFA 27(4)
[Tex. Tech. Univ., Sch. Law, Lubbock]

82-002879 Loftus, K. H., (ed.). PROCEEDINGS OF THE 1980 NORTH AMERICAN EEL CONFERENCE. *Ont. Fish. Tech. Rep. Ser.* No. 4. vi + 97p. 1982. SFA 27(4)

82-002880 Lotspeich, F. B. and W. S. Platts. AN INTEGRATED LAND-AQUATIC CLASSIFICATION SYSTEM. *N. Am. J. Fish. Manage.* 2(2):138-149. 1982. SFA 27(4)
[U.S. For. Serv., 319 SW Pine St., Box 3623, Portland, OR 97208]

82-002881 Rigler, F. H. RECOGNITION OF THE POSSIBLE: AN ADVANTAGE OF EMPIRICISM IN ECOLOGY. *Can. J. Fish. Aquatic Sci.* 39(9):1323-1331. Sept. 1982. In English with French summ. SFA 27(4)
[Dep. Biol., McGill Univ., Montreal, PQ H3A 1B1, Canada]

82-002882 Rikhter, V. A. THE DYNAMICS OF OPTIMUM FISHING INTENSITY OF FISH SPECIES WITH STRONG FLUCTUATIONS IN ABUNDANCE. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 21(4):38-48. 1981. SFA 27(4)
[AtlantNIRO, Kaliningrad, USSR] An attempt is made to clarify the concept of "optimum fishing intensity." The dynamics of the biomass of the commercial stocks of fish and catches with various levels of fishing mortality and recruitment were analyzed. The validity of assumptions regarding the increase in the coefficient of natural mortality with age and the decrease under the influence of fishing was examined. A dependence was discovered between the rate of increase in catches and recruitment. The influence of this dependence on the value of the optimum fishing intensity was investigated in connection with an assessment of the total allowable catch.

82-002883 Stange, D. AN OPEN LETTER TO ANGLERS AND FISHERIES PROFESSIONALS. *N. Am. J. Fish. Manage.* 1(2):193-199. 1981. SFA 27(4)
[In-Fisherman, Brainerd, MN 56401]

82-002884 Stone, M. D. ENVIRONMENTAL PROTECTION: FACT OR FICTION. *Proc. Annu. Meet. Colo.-Wyo. Chap. Am. Fish. Soc.* 17:56-60. 1982. Available @$10.00 from Mary McAfee, Colo. Div. Wildl., 711 Independent, Grand Junction, CO 81501. SFA 27(4)
[Wyo. Game Fish Dep., Cheyenne 82001]

## ADMINISTRATION AND PLANNING

82-002885 Brouha, P. THE FOREST PLANNING GAME. *Fisheries (Bull. Am. Fish. Soc.)* 7(5):11-13. Sept.-Oct. 1982. SFA 27(4)
[U.S. For. Serv., Federal Bldg., Missoula, MT 59807]

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82-002886 Great Lakes Fishery Commission. GREAT LAKES FISHERY COMMISSION ANNUAL REPORT FOR THE YEAR 1979. *Great Lakes Fish. Comm. Annu. Rep.* 1979. 146p. 1982. SFA 27(4)
[1451 Green Rd., Ann Arbor, MI]

82-002887 Great Lakes Fishery Commission. GREAT LAKES FISHERY COMMISSION ANNUAL REPORT FOR THE YEAR 1978. *Great Lakes Fish. Comm. Annu. Rep.* 1978. 132p. 1982. SFA 27(4)
[1451 Green Rd., Ann Arbor, MI]

82-002888 International Pacific Halibut Commission. INTERNATIONAL PACIFIC HALIBUT COMMISSION ANNUAL REPORT 1981. *Int. Pac. Halibut Comm. Annu. Rep.* 1981. 48p. 1982. SFA 27(4)
[P.O. Box 5009, University Station, Seattle, WA 98105]

82-002889 International Pacific Salmon Fisheries Commission. REPORT OF THE INTERNATONAL PACIFIC SALMON FISHERIES COMMISSION FOR THE YEAR 1981. *Int. Pac. Salmon Fish. Comm. Annu. Rep.* 1981:1-48. 1982. SFA 27(4)
[New Westminster, BC, Canada]

82-002890 Kainji Lake Research Institute. ANNUAL REPORT 1979-80. *Kainji Lake Res. Inst. Annu. Rep.* v + 73p. 1981. SFA 27(4)
[New Bussa, Nigeria]

82-002891 Kirka, A. A REVIEW OF THE EXISTING RESEARCH ACTIVITY OF THE LABORATORY OF FISHERY RESEARCH AND HYDROBIOLOGY, BRATISLAVA. *Pr. Lab. Ryb. Hydrobiol.* 3:7-18. 1981. SFA 27(4)
[Lab. Fish. Res. Hydrobiol., Drieňová 3, 829 68, Bratislava, Czechoslovakia]

82-002892 Scott, D. P. BIENNIAL REPORT - 1978-80, WESTERN REGION, DEPARTMENT OF FISHERIES AND OCEANS. *Can. Tech. Rep. Fish. Aquatic Sci.* No. 1068. vi + 42p. Aug. 1982. In English and French. SFA 27(4)
[Dep. Fish. Oceans, Winnipeg, MB R3T 2N6, Canada]

## HABITAT ALTERATIONS

82-002893 Binns, N. A. STREAM IMPROVEMENT IN WYOMING. *Proc. Annu. Meet. Colo.-Wyo. Chap. Am. Fish. Soc.* 17:42-47. 1982. Available @ $10.00 from Mary McAfee, Colo. Div. Wildl., 711 Independent, Grand Junction, CO 81501. SFA 27(4)
[Wyo. Game Fish Dep., P.O. Box 342, Lander 82520]

82-002894 Buckley, R. M. MARINE HABITAT ENHANCEMENT AND URBAN RECREATIONAL FISHING IN WASHINGTON. *Mar. Fish. Rev.* 44(6-7):28-37. June-July 1982. SFA 27(4)
[Wash. Dep. Fish., 115 Gen. Admin. Bldg., Olympia 98504] A marine fish enhancement program started in 1974 has emphasized the use of habitat enhancement structures (artificial reefs), both in conjunction with public fishing piers and to create "fishing reefs" for boat anglers, to improve urban recreational fishing in Puget Sound. The enhanced areas were designed and sited to develop biologically into replicates of natural rocky reef

HABITAT ALTERATIONS (CONTINUED)

82-002894 CONTINUED communities in order to promote productive fisheries. The site selection process was based on indexes of the macrobiota assemblages on rocky reef control areas in the same region and on consideration of potential impacts on fisheries and commerce. Experimental design strategies for both the entire habitat enhancement area and the individual enhancement structures were used to determine the optimum balance between aggregation and production of target species and management for sustained, quality fisheries. Major structural design elements were found to be horizontal and vertical relief and numbers and sizes of interstitial spaces. Abundant and diverse algal growth on the enhancement structures increases habitat complexity and heterogeneity, and may well be the most important element in the transition from introduced materials to replicates of productive natural reefs. Successional development of fish communities appears to proceed from a primcipally aggregated species base during initial colonization to a "forager-aggregater" community structure as food items develop on the enhancement structures.

82-002895 Conder, A. L. APPLICATION OF U.S. FISH AND WILDLIFE SERVICE INCREMENTAL METHODOLOGY ON SELECTED STREAMS: WYOMING. *Proc. Annu. Meet. Colo.-Wyo. Chap. Am. Fish. Soc.* 17:48-55. 1982. Available @ $10.00 from Mary McAfee, Colo. Div. Wildl., 711 Independent, Grand Junction, CO 81501. SFA 27(4)
[Wyo. Game Fish Dep., Cheyenne 82002]

82-002896 Dugas, R.; V. Guillory and M. Fischer. OIL RIGS AND OFFSHORE SPORT FISHING IN LOUISIANA. *La. Dep. Wildl. Fish. Tech. Bull.* No. 35. p. 85. Sept. 1982. Abstract only. SFA 27(4)

82-002897 Grant, J. J.; K. C. Wilson; A. Grover and H. A. Togstad. EARLY DEVELOPMENT OF PENDLETON ARTIFICIAL REEF. *Mar. Fish. Rev.* 44(6-7):53-60. June-July 1982. SFA 27(4)
[Calif. Dep. Fish Game, 350 Golden Shore, Long Beach, CA 90802] An artificial reef was constructed of 9,100 t(10,000 tons) of quarry rock, in southern California, 1.6 km (1 mile) off shore of Camp Pendleton. The reef was arranged in eight high-relief modules covering 2.8 hectares (7 acres) of sand substrate in 13.1 m (43 feet) of water. Management techniques are being utilizated in an effort to accelerate and direct successional changes on the reef. These have included transplanting giant kelp, *Macrocystis* spp., and red abalone, *Haliotis rufescens*. Successional changes and the impact of management operations on the reef were monitored. After 1 year 19 species of fishes and 26 species of invertebrates were observed.

82-002898 Grove, R. S. ARTIFICIAL REEFS AS A RESOURCE MANAGEMENT OPTION FOR SITING COASTAL POWER STATIONS IN SOUTHERN CALIFORNIA. *Mar. Fish. Rev.* 44(6-7):24-27. June-July 1982. SFA 27(4)
[Res. Dev. Div., South. Calif. Edison Co., Rosemead, CA 91770]

82-002899 Guillory, V. A COMPARISON OF FISH POPULATIONS IN BASELINE AND DREDGED AREAS IN LAKE PONTCHARTRAIN. *La. Dep. Wildl. Fish. Tech. Bull.* No. 35. p. 63-67. Sept. 1982. SFA 27(4)

82-002900 Guillory, V. ENVIRONMENTAL EFFECTS OF ESTUARINE DREDGING AND SPOIL DISPOSAL, A LITERATURE REVIEW. *La. Dep. Wildl. Fish. Tech. Bull.* No. 35. p. 37-61. Sept. 1982. SFA 27(4)
The environmental effects of channel dredging in estuaries are reviewed in this report. Major changes occurring in conjunction with channelization include: (1) water quality degradation, including increases in total

## HABITAT ALTERATIONS (CONTINUED)

82-002900 CONTINUED suspended solids and oxygen demand and possibl release of toxicants bound to the sediments; (2) increased turbidity sedimentation because of suspension of sediments and formation of flows; (3) physical removal of organisms; (4) physical changes in habit such as creation of deep channels in shallow littoral zones, changes sediment composition, loss of aquatic vegetation, and formation of spoil islands; (5) increased salinity intrusion associated with movement of saline water into and through channels; (6) hydrological regime alterati brought about by the placement of spoil islands and channels; (7) increa erosion; and (8) secondary effects caused by increased residential industrial growth. Most dredge channels also require periodic maintenan dredging, thereby resulting in further environmental changes. Effects these physico-chemical modifications on the estuarine biota are discuss General guidelines and criteria to minimize ecological damage from dred projects are listed. A supplemental bibliography of papers not cited in present article is also included.

82-002901 Hassemer, P. F. and B. E. Rieman. OBSERVATIONS OF DEEP-SPAWNI KOKANEE ON ARTIFICIALLY CREATED SPAWNING HABITAT. *N. Am. J. Fish. Manage* 1(2):173-176. 1981. SFA 27(4)
[Dep. Fish. Resour., Coll. For. Wildl. Range Sci., Univ. Idaho, Mosco 83843]

82-002902 Hilgert, P. EVALUATION OF INSTREAM FLOW METHODOLOGIES FISHERIES IN NEBRASKA. *Nebr. Game Parks Comm. Tech. Ser.* No. 10. 50p. 19 SFA 27(4)
[Nebr. Game Parks Comm., Lincoln] Five instream flow methods were appli to a variety of streams within the state of Nebraska. These were 1) Tennant method, 2) a modification of the Tennant method, 3) IFG1A, a sing cross-section average-parameter method, 4) the Incremental method, usi the WSP hydraulic simulation program and 5) the Incremental method, usi the IFG4 hydraulic simulation program. Each method was applied followi standard published procedures, and instream flow recommendations developed for the streams addressed using each method separatel Evaluation of the methods showed that the modification of the Tennant meth overcame some of the deficiencies of the Tennant method and appears to most useful for Nebraskan reconnaissance-grade studies. Where insteam fl issues might be resolved through negotiation, or where they invol valuable fishery resources, the Incremental method might be justified. investigator, using WSP program for unstable bed streams and the I program for stable bed streams, can assess the effects of altered fl regimes on stream fisheries. Although requiring a greater time financial commitment, the Incremental method can be used to provide information needed for responsibly resolving conflicts.

82-002903 Honda, K.; H. Myose and T. Sawada. [COMPARISON EXPERI BETWEEN A MODEL AND A FULL SCALE ARTIFICIAL FLOATING FISH REEF.] *Bull. J* *Soc. Sci. Fish.* 48(7):927-931. July 1982. In Japanese with English summ. 27(4)
[4-10, Nishigomon 2, Kamakura, Kanagawa 248, Japan]

82-002904 Hueckel, G. J. and R. L. Stayton. FISH FORAGING ON AN ARTIFIC REEF IN PUGET SOUND, WASHINGTON. *Mar. Fish. Rev.* 44(6-7):38-44. June- 1982. SFA 27(4)
[Wash. Dep. Fish., 115 Gen. Admin. Bldg., Olympia 98504] This study designed to determine the degree of foraging by striped seaperch, *Embiot lateralis*; pile perch *Rhacochilus vacca*; and quillback rockfish,

## ABITAT ALTERATIONS (CONTINUED)

2-002904 CONTINUED *Sebastes maliger*, on organisms associated with an rtificial reef in Puget Sound, Wash. Stomachs of these fish species, issected from 609 fish speared on, around, and near the artificial reef etween August 1977 and December 1978, were examined and the contents were ompared with organisms present in the immediate area. Medium and large fish over 121 mm for all three species) foraged more on organisms associated ith the artificial reef than did small fish of the same species. Abundance f preferred food items of medium and large striped seaperch and quillback ockfish associated with the artificial reef was an important factor in ttracting large numbers of these species. Conversely, medium and large ile perch were largely absent from the artificial reef due to a lack of referred food items.

2-002905 Platts, W. S. LIVESTOCK AND RIPARIAN-FISHERY INTERACTIONS: WHAT RE THE FACTS? *Trans. N. Am. Wildl. Nat. Resour. Conf.* 47:507-515. 1982. SFA 7(4)
[U.S. For. Serv., Intermountain For. Range Exp. Stn., Boise, ID]

2-002906 Rinne, J. N. MOVEMENT, HOME RANGE, AND GROWTH OF A RARE OUTHWESTERN TROUT IN IMPROVED AND UNIMPROVED HABITATS. *N. Am. J. Fish. anage.* 2(2):150-157. 1982. SFA 27(4)
[Rocky Mtn. For. Range Exp. Stn., For. Sci. Lab., ASU Campus, Tempe, AZ 5287]

2-002907 Schlosser, I. J. TROPHIC STRUCTURE, REPRODUCTIVE SUCCESS, AND ROWTH RATE OF FISHES IN A NATURAL AND MODIFIED HEADWATER STREAM. *Can. J. ish. Aquatic Sci.* 39(7):968-978. July 1982. In English with French summ. FA 27(4)
[Dep. Biol., Box 8238, University Station, Grand Forks, ND 58202]

2-002908 Sheehy, D. J. THE USE OF DESIGNED AND PREFABRICATED ARTIFICIAL EEFS IN THE UNITED STATES. *Mar. Fish. Rev.* 44(6-7):4-15. June-July 1982. FA 27(4)
[Aquabio, Inc., 2957 Sunset Blvd., Belleair Bluffs, FL 33540] Designed nd prefabricated artificial reefs have been used with great success to romote fisheries development in Japan and Taiwan, and have been tested on everal occasions in the United States. Although efforts in the early 1960's o test Japanese-style reefs in California, New York, and Florida met with roblems due to lack of expericence with that type of reef, those units hich were properly placed proved effective in attracting fish. Pumice oncrete shelters designed for lobsters were tested in Rhode Island in the 970's and were shown to increase significantly the abundance of resident obsters in areas previously devoid of shelter. The Japanese have recently eveloped a new generation of large-scale, advanced-technology artificial eefs. To introduce this technology in the United States, Japanese FRP fiberglass reinforced plastic) reefs have been installed off Florida as art of a demonstration/research project funded by the National Marine isheries Service. Their cost-effectiveness will be evaluated by comparing hem with concrete culvert reefs.

-002909 Stone, R. B. ARTIFICIAL REEFS: TOWARD A NEW ERA IN FISHERIES HANCEMENT? *Mar. Fish. Rev.* 44(6-7):2-3. June-July 1982. SFA 27(4)
[NMFS, Washington, DC 20235]

## HABITAT ALTERATIONS (CONTINUED)

82-002910 Terashima, A. and T. Ueda. [EFFECTS OF BOTTOM DREDGING ON S ENVIRONMENTAL FACTORS AND BENTHIC ANIMALS IN THE SOUTH BASIN OF LAKE BIWA.] *Jpn. J. Limnol.* 43(2):81-87. Apr. 1982. In Japanese with English summ. S 27(4)
[Otsu Hydrobiol. Stn., Kyoto Univ., Shimosakamoto, Otsu, Shiga-ken, 52 01, Japan]

82-002911 Timmons, T. J. and W. L. Shelton. MARKING FISH ATTRACTORS LAKES WITH FLUCTUATING WATER LEVELS. *N. Am. J. Fish. Manage.* 2(1):97. 19 SFA 27(4)
[Auburn Agric. Exp. Stn., Dep. Fish. Allied Aquacult., Auburn Univ., 36849]

82-002912 Walton, J. M. THE EFFECTS OF AN ARTIFICIAL REEF ON RESID FLATFISH POPULATIONS. *Mar. Fish. Rev.* 44(6-7):45-48. June-July 1982. SF 27(4)
[Peninsula Coll., Port Angeles, WA 98362]

82-002913 Woodhead, P. M. J.; J. H. Parker and I. W. Duedall. THE COAL- WASTE ARTIFICIAL REEF PROGRAM (C-WARP): A NEW RESOURCE POTENTIAL F FISHING REEF CONSTRUCTION. *Mar. Fish. Rev.* 44(6-7):16-23. June-July 1982 SFA 27(4)
[Mar. Sci. Res. Cent., State Univ. N.Y., Stony Brook 11794] T feasibility of using solid blocks of waste material from coal_fired pow plants for underwater construction, including building artificial fishi reefs, is being tested. On 12 September 1980, a 500-ton demonstration ree consisting of 15,000 solid blocks of satabilized fly ash and flue-g desulfurization (scrubber) sludge from coal-burning power stations, w constructed in the Atlantic Ocean off Long Island, N.Y. Biologica settlement and epifaunal colonization are already well established. Fis inhabit the reef at high population densities, and crabs and lobsters hav begun to immigrate. Laboratory and sea experiments over the past 5 yea suggest that stabilized coal waste blocks may be environmentally acceptabl in the ocean.

## HARVEST, CREEL CENSUS, ETC.

82-002914 Bimber, D. L. and A. A. Nigro. THE SPRING SALMONID FISHERY A THERMAL DISCHARGE IN LAKE ERIE AT DUNKIRK HARBOR. *Ohio J. Sci.* 82(4):19 195. Sept. 1982. SFA 27(4)
[Great Lakes Res. Div., Inst. Sci. Technol. Bldg., Univ. Mich., Ann Arb 48109] A creel survey was conducted from 10 March to 30 April 1977 Dunkirk harbor located on the eastern shore of Lake Erie. Coho sal (*Oncorhynchus kisutch*), rainbow trout (*Salmo gairdneri*), and brown tro (*Salmo trutta*) comprised 55% of angler harvest. Finclips indicated th 13.5% of coho salmon caught in the harbor had been stocked in O tributaries of the lake. Average catch per unit effort estimates for t salmonid part of the catch were 0.298 fish per hour (pier) and 0.322 fi per hour (boat) for successful salmonid anglers. The estimated total wei of the salmonid catch taken during the study was 610 kg.

82-002915 Bjerknes, V. and A. Vaag. MIGRATIONS AND CATCH STATISTICS OF PINK SALMON, *ONCORHYNCHUS GORBUSCHA*, IN THE FINMARK AREA, NORTHERN NO *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 21(1):48-53. 1981. SFA 27(4)
[Dir. Fish. Freshwater Fishes, Arendal, Norway]

## ARVEST, CREEL CENSUS, ETC. (CONTINUED)

2-002916 Devadoss, P. A PRELIMINARY STUDY ON THE BATOID FISHERY OF
UDDALORE WITH A NOTE ON THE BIOLOGY. *Indian J. Fish.* 25(1-2):180-187. 1978.
FA 27(4)

2-002917 Krishnamoorthi, B. A NOTE ON THE CATCH TRENDS OF CATFISHES
*ACHYSURUS THALASSINUS* AND *T. TENUISPINIS* BASED ON EXPLORATORY DATA FOR THE
ERIOD FROM 1966 TO 1976. *Indian J. Fish.* 25(1-2):268-270. 1978. SFA 27(4)

2-002918 Kunjipalu, K. K. and A. C. Kuttappan. NOTE ON AN ABNORMAL CATCH
F DEVIL RAYS *DICEROBATIS EREGOODOO* DAY IN GILL NETS OFF VERAVAL. *Indian J.
ish.* 25(1-2):254-256. 1978. SFA 27(4)

2-002919 Kuthalingam, M. D. K.; P. Livingston and P. S. S. Sarma.
BSERVATIONS ON THE CATCHES OF THE MECHANISED BOATS AT NEENAKARA. *Indian J.
ish.* 25(1-2):98-108. 1978. SFA 27(4)

2-002920 Mahadevan Pillai, P. K. A PRELIMINARY STUDY ON THE CATFISH
ISHERY OFF BLANGAD ON THE SOUTHWEST COAST OF INDIA. *Indian J. Fish.* 25(1-
):240-242. 1978. SFA 27(4)

-002921 Prasannakumari, B. and S. K. Dharmaraja. ON THE POMFRET FISHERY
 INDIA WITH SPECIAL REFERENCE TO THE CATCH STATISTICS OF MAHARASHTRA AND
UJARAT COASTS. *Indian J. Fish.* 25(1-2):214-221. 1978. SFA 27(4)

-002922 Rach, J. J. and F. P. Meyer. WINTER HARVEST OF BLUEGILLS IN
76-1977 FROM LAKE ONALASKA, WISCONSIN. *N. Am. J. Fish. Manage.* 2(1):28-
. 1982. SFA 27(4)
[U.S. FWS, Natl. Fish. Res. Lab., P.O. Box 818, La Crosse, WI 54601]

-002923 Thomas, P. A. and M. M. Kunju. ON AN UNUSUAL CATCH OF GHOL
*UDOSCIAENA DIACANTHUS* OFF GOA. *Indian J. Fish.* 25(1-2):266-268. 1978.
A 27(4)

-002924 Walker, M. H. THE PRESENT STATE OF THE WESTERN AUSTRALIAN
SHERY FOR AUSTRALIAN SALMON. *West. Aust. Dep. Fish. Wildl. Rep.* No. 52.
. 1982. SFA 27(4)
[West. Aust. Mar. Res. Lab., P.O. Box 20, North Beach, Western Australia
20, Australia]

## GULATIONS

-002925 Anderson, R. M. and R. B. Nehring. THE CATCH AND RELEASE
ERIENCE ON THE FRYINGPAN AND SOUTH PLATTE RIVERS. *Proc. Annu. Meet.
o.-Wyo. Chap. Am. Fish. Soc.* 17:16-32. 1982. Available @ $10.00 from Mary
fee, Colo. Div. Wildl., 711 Independent, Grand Junction, CO 81501. SFA
4)
2126 N. Weber, Colorado Springs, CO 80907] Three years of population data
 the South Platte found the catch and release section averaged 3.4 times
e biomass and 1.6 times more trout per unit area than the standard
ulation area. Fifty-nine percent of the trout population under catch and

REGULATIONS (CONTINUED)

82-002925 CONTINUED release fishing were >30 cm (age 3 or old compared to only 9 percent in the harvest section. This equates to den estimates of 1,097 and 106 trout >30 cm/ha in the catch and release standard areas, respectively. A very high catch rate of 1.14 trout per was maintained with catch and release compared to 0.65 in the harvest that had the benefit of catchable stocking. Twenty-five times more tr size trout (> 38 cm) were caught in the C & R area than in the 8 trout/ section. Standing crop in the standard regulation area of the Fryin River dropped dramatically from 136 kg/ha to 84.4 kg/ha just 2 years a stocking was eliminated. In the same time period, biomass increased in catch and release section from 251-333 kg/ha. Catch statistics for Fryingpan in the absence of angler mortality showed the mean size of t was greater and overall catch per man hour (CPMH) was 3 times higher under standard statewide regulations.

82-002926 Dawson, C. P. and B. T. Wilkins. MOTIVATIONS OF NEW YORK VIRGINIA MARINE BOAT ANGLERS AND THEIR PREFERENCES FOR POTENTIAL FIS CONSTRAINTS. *N. Am. J. Fish. Manage.* 1(2):151-158. 1981. SFA 27(4)
[Dep. Nat. Resour., Cornell Univ., Ithaca, NY 14853]

82-002927 Dunning, D. J.; Q. Ross and J. Gladden. EVALUATION OF MINI SIZE LIMITS FOR ST. LAWRENCE RIVER NORTHERN PIKE. *N. Am. J. Fish. Man* 2(2):171-175. 1982. SFA 27(4)
[Power Auth. State N.Y., 10 Columbus Cir., New York 10019]

82-002928 Paragamian, V. L. CATCH RATES AND HARVEST RESULTS UNDER A 14 INCH MINIMUM LENGTH LIMIT FOR LARGEMOUTH BASS IN A NEW IOWA IMPOUNDMENT. *Am. J. Fish. Manage.* 2(3):224-231. 1982. SFA 27(4)
[Iowa Conserv. Comm., R.R. 2, Box 269, Manchester 52057]

82-002929 Snow, H. E. HYPOTHETICAL EFFECTS OF FISHING REGULATIONS MURPHY FLOWAGE, WISCONSIN. *Wis. Dep. Nat. Resour. Tech. Rep.* NO. 131. 1982. SFA 27(4)
[Wis. Dep. Nat. Resour., Box 309, Spooner 54801] This paper summarizes hypothetical effects of bag, season, and size limits on the harvest panfish, northern pike, and largemouth bass in Murphy Flowage, Wisco Complete angler records were obtained through a compulsory registrat type creel census for 15 years. There were no bag, season, or size limits effect at any time during the study. The hypothetical reduction in har with various regulations was calculated from detailed harvest records. present bag limits in effect in most of Wisconsin would have had li effect on the observed harvest in Murphy Flowage. A 50-fish daily bag li on panfish in aggregate would have reduced the observed harvest 2. summer and 13.8% in winter. A 5-fish daily bag on gamefish would reduced the northern pike harvest 0.5% in summer and 1.5% in winter, the harvest of largemouth bass would have been reduced 2.5% in summer, no effect in winter. A year-round open season would have had very li effect on the harvest. A maximum of 7% of the northern pike and 4% of largemouth bass were taken during the normal closed season, 1 March to 1st Saturday of May. A later opening date could have a marked effect on harvest, especially on largemouth bass since 50% of the annual harvest taken by the end of June. Size limits alone or in combination with l opening dates had the most potential for reducing the observed harvest. 18-inch limit on northern pike would have reduced the harvest 22% and a inch limit on largemouth bass would have reduced bass harvest 27%. A sl length limit of 18-22 inches on northern pike would have reduced the har 40% while a 12- to 15-inch limit on largemouth bass would have reduced harvest 30%.

## REGULATIONS (CONTINUED)

82-002929 CONTINUED Some important considerations in the use of length limits are: (1) the possibility of losses of the protected sizes due to hooking mortality, (2) possible alteration of the sex ratio of northern pike populations, (3) lack of control of forage species by bass if their preferred diet of crayfish is abundant, and (4) the possibility of reduced growth rates. Other in-depth exploitation and mortality studies in Murphy Flowage have shown that the difference in total mortality with fishing and without fishing is relatively small. Therefore, it was concluded that liberalized regulations within the range of fishing pressure and exploitation experienced in Murphy Flowage were not a detriment to the fish populations, and that the hypothetical results of various regulations closely approximated those that would have been obtained with normal regulations.

## FISH CONTROL AND REMOVAL

82-002930 Hazzard, L. K. AIDES TO LAKE REHABILITATION: AERIAL RETENONE APPLICATION AND A SIMPLIFIED DETOXIFICATION PROCEDURE. *Proc. Annu. Meet. Colo.-Wyo. Chap. Am. Fish. Soc.* 17:1-7. 1982. Available @ $10.00 from Mary McAfee, Colo. Div. Wildl., 711 Independent, Grand Junction, CO 81501. SFA 27(4)
[2300 S. Townsend, Montrose, CO 81401] A successful attempt was made to eliminate rough fish from part of a Colorado drainage that contained seven lakes, numerous bogs and fifteen miles of tributaries. The use of a modified fish tank in a Cessna 185 reduced the work effort on the ground and contributed to the success of the project. In addition, the use of a 500-gallon fish tank with a simplified constant flow mechanism prevented fish loss below the desired natural barrier using $KMnO_4$ to detoxify the rotenone. Both the aerial rotenone application and the detoxification process were of great benefit in helping achieve a management target that can benefit the manager and the user of the resource.

## MARKING AND TAGGING

82-002931 Boxrucker, J. C. MASS MARKING OF FINGERLING LARGEMOUTH BASS BY FIN-CLIPPING FOLLOWED BY FREEZE-CAUTERIZATION OF THE WOUND. *N. Am. J. Fish. Manage.* 2(1):94-96. 1982. SFA 27(4)
[Okla. Fish. Res. Lab., 1416 Planck St., Norman 73069]

82-002932 Ebener, M. P. and F. A. Copes. LOSS OF FLOY ANCHOR TAGS FROM LAKE WHITEFISH. *N. Am. J. Fish. Manage.* 2(1):90-93. 1982. SFA 27(4)
[Wis. Coop. Fish. Res. Unit, Univ. Wis., Stevens Point 54481]

82-002933 McAfee, M. E. FLUORESCENT PIGMENT SPRAY-MARKING: DO WE KNOW WHERE WE STAND? *Proc. Annu. Meet. Colo.-Wyo. Chap. Am. Fish. Soc.* 17:79-85. 1982. Available @ $10.00 from Mary McAfee, Colo. Div. Wildl., 711 Independent, Grand Junction, CO 81501. SFA 27(4)
[Colo. Div. Wildl., 711 Independent, Grand Junction 81501]

82-002934 Medved, R. J. AQUARIUM AIRLINE TUBING MARKER FOR OBSERVING FISH MOVEMENTS. *Prog. Fish-Cult.* 44(3):160-161. July 1982. SFA 27(4)
[Grad. Sch. Oceanogr., Univ. R.I., Narragansett 02882]

## MARKING AND TAGGING (CONTINUED)

82-002935 Ostergaard, D. E. RETENTION OF CODED WIRE TAGS IN LAKE TROUT. *Prog. Fish-Cult.* 44(3):162. July 1982. SFA 27(4)
[U.S. FWS, Allegheny Natl. Fish Hatchery, Warren, PA 16365]

82-002936 Tranquilli, J. A. and W. F. Childers. GROWTH AND SURVIVAL OF LARGEMOUTH BASS TAGGED WITH FLOY ANCHOR TAGS. *N. Am. J. Fish. Manage.* 2(2):184-187. 1982. SFA 27(4)
[Ill. Dep. Conserv., 600 N. Grand Ave., Springfield 62706]

## STOCKING AND INTRODUCTIONS

82-002937 Dickson, T. A. and H. R. MacCrimmon. INFLUENCE OF HATCHERY EXPERIENCE ON GROWTH AND BEHAVIOR OF JUVENILE ATLANTIC SALMON (*SALMO SALAR*) WITHIN ALLOPATRIC AND SYMPATRIC STREAM POPULATIONS. *Can. J. Fish. Aquatic Sci.* 39(11):1453-1458. Nov. 1982. In English with French summ. SFA 27(4)
[Environmental Management Assoc., 1510 Tenth Ave. S.W., Calgary, AB T3C 0J5, Canada]

82-002938 Ellison, J. P. LAKE HENNESSEY CATCHABLE TROUT TAGGING PROGRAM, 1980-81. *Calif. Dep. Fish Game Inland Fish. Admin. Rep.* No. 82-6. 11p. Aug. 1982. SFA 27(4)

Angler harvest of catchable-sized trout at Lake Hennessey and the Hennessey impoundment, Napa County, was assessed using $5.00 reward tags in the fall, winter, and spring of 1980-81. Fish planted in the lake returned at a low rate (11.4%). The return rate of fish planted in the impoundment was better (34.9%) but still below Fish and Game Commission policy standards. Possible reasons for low angler harvest are discussed and management recommendations are made.

82-002939 Harshbarger, T. J. and P. E. Porter. EMBRYO SURVIVAL AND FRY EMERGENCE FROM TWO METHODS OF PLANTING BROWN TROUT EGGS. *N. Am. J. Fish Manage.* 2(1):84-89. 1982. SFA 27(4)
[Southeast. For. Exp. Stn., USDA, For. Serv., Asheville, NC 28804]

82-002940 Hein, S. and J. Shepard. REARING STRIPED BASS FOR RELEASE INTO THE BARATARIA BAY ESTUARY, SOUTHEAST LOUISIANA. *La. Dep. Wildl. Fish. Tech. Bull.* No. 35. p. 15-35. Sept. 1982. SFA 27(4)

Striped bass, *Morone saxatilis*, were reared and stocked into Barataria Bay, an estuarine system located along the southeast coast of Louisiana. Over a five-year period, 1975-1979, 160,000 fingerling bass were introduced into the system. Commercial fishermen reported capturing stripers, but only one was verified by biologists. It is uncertain whether the fish captured came from this stocking attempt. Various rearing techniques were evaluated. In all cases, minimal handling proved beneficial. Salinity of 10-25 ppt was used to conduct tolerance tests on sacfry bass. No significant loss of fish was encountered at the $\alpha = 0.05$ level.

82-002941 International Council for the Exploraton of the Sea. STATUS (1980) OF INTRODUCTIONS OF NON-INDIGENOUS MARINE SPECIES TO NORTH ATLANTIC WATERS. *Int. Counc. Explor. Sea. Coop. Res. Rep.* No. 116. ii + 87p. May 1982. SFA 27(4)
[Palaegade 204, 1261 Copenhagen, Denmark]

## TOCKING AND INTRODUCTIONS (CONTINUED)

2-002942 Laarman, P. W. VITAL STATISTICS OF A MICHIGAN FISH POPULATION,
TH SPECIAL EMPHASIS ON THE EFFECTIVENESS OF STOCKING 15-CM WALLEYE
NGERLINGS. *N. Am. J. Fish. Manage.* 1(2):177-185. 1981. SFA 27(4)
[Inst. Fish. Res., Mich. Dep. Nat. Resour., Ann Arbor 48109]

2-002943 Moring, J. R. AN EFFICIENT HATCHERY STRAIN OF RAINBOW TROUT FOR
TOCKING IN OREGON STREAMS. *N. Am. J. Fish. Manage.* 2(3):209-215. 1982. SFA
7(4)
[Me. Coop. Fish. Res. Unit, Dep. Zool., Univ. Me., Orono 04469]

2-002944 Roys, R. S. INTERSTATE AND INTERNATIONAL MANAGEMENT
PLICATIONS OF SALMON HATCHERY PRODUCTION. *Trans. N. Am. Wildl. Nat.
esour. Conf.* 47:641-647. 1982. SFA 27(4)
[Alaska Dep. Fish Game, Juneau]

-002945 Skinner, J. M. STOCKING OF A NEW IMPOUNDMENT BY INDIGENOUS
REAM SPECIES: EVALUATION OF A FISHERIES MANAGEMENT TOOL. *Ph.D.
issertation, Ohio State Univ.* 134p. 1982. From Diss. Abstr. Int. B Sci.
g. 43(1):65. July 1982. SFA 27(4)
A non-stocking management strategy was evaluated at Paint Creek Lake,
io, from 1974-1978. Objectives included: (1) documentation of
hthyofaunal successional changes in a new reservoir, (2) determination of
e length of time needed for ecosystem stability, (3) determination of
ether a successful sport fishery can develop in the absence of stocking,
d (4) development of specific recommendations for the management of this
ke. Succession proceeded as expected with the loss of more riverine
ecies and addition of others that were not common in the free-flowing
ream. Total catch at electrofishing index stations peaked in the third and
urth years and declined the the fifth, mainly due to winterkill mortality
the dominant forage fish, gizzard shad (*Dorosoma cepedianum*). Growth was
ceptional for most game species in the first three years, but had slowed
the fourth and fifth years. Sport fishing catch rate stayed constant as
shing pressure peaked in the third year and declined thereafter. Sport
tch rate was comparable to other stocked Ohio lakes. Species primarily
ught and caught were black basses (*Micropterus* sp.), crappies (*Pomoxis*
.) and bluegill (*Lepomis macrochirus*). Gizzard shad quickly outgrew the
edatory ability of the game fish. Additional predatory pressure is
commended to utilize the shad biomass early in its development.

## SHING GEAR AND TECHNIQUES

-002946 Adkins, G. and M. J. Bourgeois. AN EVALUATION OF GILL NETS OF
RIOUS MESH SIZES. *La. Dep. Wildl. Fish. Tech. Bull.* No. 36. 59p. Sept.
32. SFA 27(4)

-002947 Campana, S. E. TECHNIQUE FOR CONVERTING A BEACH SEINE FOR
ERATION BY ONE PERSON. *Prog. Fish-Cult.* 44(3):152-153. July 1982. SFA
(4)
[Inst. Anim. Resour. Ecol., Univ. British Columbia, Vancouver, BC V6T
5, Canada]

-002948 Jacobs, K. E. and W. D. Swink. ESTIMATIONS OF FISH POPULATION
E AND SAMPLING EFFICIENCY OF ELECTROFISHING AND ROTENONE IN TWO KENTUCKY
LWATERS. *N. Am. J. Fish. Manage.* 2(3):239-248. 1982. SFA 27(4)
[U.S. FWS, East Central Reservoir Invest., Bowling Green, KY 42101]

## FISHING GEAR AND TECHNIQUES (CONTINUED)

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TRAP NETS FOR EIGHT SPECIES OF FISH. *N. Am. J. Fish. Manage.* 2(1):33-
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[Mich. Dep. Nat. Resour., Inst. Fish. Res., Ann Arbor 48109]

82-002950 Lilygreen, V. and B. Meade. FISH STOCKS UNDER PRESSURE F
NYLON MONOFILAMENT GILL-NETS. *Mar. Pollut. Bull.* 13(8):263-266. Aug. 19
SFA 27(4)

82-002951 MacKenzie, C. L., Jr. COMPATIBILITY OF INVERTEBRATE POPULATIO
AND COMMERCIAL FISHING FOR OCEAN QUAHOGS. *N. Am. J. Fish. Manage.* 2(3):2
275. 1982. SFA 27(4)
[NMFS, Sandy Hook Lab., Highlands, NJ 07732]

82-002952 Main, J. and G. I. Sangster. A STUDY OF SEPARATING FISH F
*NEPHROPS NORVEGICUS* L. IN A BOTTOM TRAWL. *Scott. Fish. Res. Rep.* No. 24.
1982. SFA 27(4)
[Mar. Lab., Aberdeen, Scotland]

82-002953 Nishiyama, S.; T. Miura; H. Nakamura and S. Shimizu. [DY
CHARACTERISTIC OF MID WATER TRAWL NETS.] *Bull. Jpn. Soc. Sci. Fi*
48(8):1101-1105. Aug. 1982. In Japanese with English summ. SFA 27(4)
[Fac. Fish., Hokkaido Univ., Hakodate 041, Japan]

82-002954 Nishiyama, S.; T. Miura; H. Nakamura and S. Shimizu. [STA
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## ISHWAYS, FISH PASSAGE THROUGH DAMS, ETC.

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[1041 S. Harlan Way, Lakewood, CO 80226] An irrigation project is being onstructed in North Dakota which will transport water from the Missouri iver drainage to the Hudson Bay drainage. To prevent interbasin transport f undesirable fish, a fine mesh, fixed, horizontal screen is being eveloped. Laboratory tests were conducted to evaluate the filtration fficiency of the design using live or preserved fish eggs and larvae; to valuate hydraulic features of the design, including development of sizing uidelines and optimization of self-cleaning features; and to assist in esign and development of hardware features, spray cleaning, seal designs, nd screen inspection and repair techniques. Operation- and mantenance-elated problems are being evaluated at a field test facility. Items being onsidered at the field test facility include screen fouling and cleaning, creen wear, corrosion and materials selection, and debris types and antities. Accessory equipment being evaluated includes traveling water creens, vibrating screens, automation devices, and debris handling ystems. Maintenance requirements for the prototype structure are being ormulated.

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[Cent. Qual. Sci., Univ. Wash., Seattle 98195] Owing to the lack sufficient parameters, certain nonlinear exploitation models of co usage in fisheries management are thought to be too inflexible to portr the productivities of fish stocks with sufficient fidelity. These mode [typified by the formulaion of Schaefer, 1954] are statistically wel behaved, however, since their governing equations all have fixed degrees nonlinearity. Although one model of record [Pella and Tomlinson, 19 offers an extra degree of parametric freedom not found in the aforementio models, its productivity equation contains a variable exponent th introduces variable nonlinearity into the fitting procedure, which is undesirable property that often leads to ill-determined parame estimates. A new productivity formulation of fixed degree is developed he which exhibits the extra degree of parametric control not found in th Schaefer model but avoids the instabilities rising from variable expone (as in the Pella-Tomlinson model) by having its parametric controls wholl contained by its coefficients. Some of the attributes and shortcomings nonlinear single- and multiple-species models are also discussed.

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Abundance, biomass, growth, reproduction and mortality were estimated for

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82-002981 CONTINUED largemouth bass, *Micropterus salmoides* (Lacépède) and redbreast sunfish *Lepomis auritus* (Linnaeus) in Calder Lake, N.Y. in the summers of 1978 and 1979. The population of each species was broken down into two groups: Young of the Year and $1^+$ and older fish. $1^+$ and older bass and sunfish were caught by angling and tagged with small plastic bags. Abundance was estimated by a continuous mark-recapture technique. Young of the Year bass and sunfish were caught by electroshocking and marked by clipping one pelvic fin. A single census mark-recapture technique was used to estimate the abundance of Young of the Year fishes. Weight and length of each fish were recorded and a scale sample was taken from each fish. The population of largemouth bass in 1978 had an abundant $3^+$ age-class while the redbreast sunfish had a smoothly descending age-class structure from the $1^+$ to older sunfish, suggesting a relatively constant mortality rate year to year. Growth of bass was low compared to growth of other bass populations while growth of the redbreast sunfish was high compared to redbreast populations in the northeastern U.S. In 1979 the abundance and biomass of the bass population decreased about 40% from the previous year but the sunfish population remained about the same. This suggests that stocking programs in the northeastern U.S. might use the combination of largemouth bass and redbreast sunfish to reduce the chance of sunfish overpopulation--a common problem in largemouth bass-bluegill (*L. macrochirus*) communities. Compared to other U.S. populations reproduction of largemouth bass in Calder Lake was low and mortality was high while reproduction and mortality of redbreast sunfish were both low. Data on the population dynamics were integrated into hypothetical models for each species to estimate the biomass of bass and sunfish which could be removed each year on a sustained basis from Calder Lake. Important results include the accumulation of baseline data from a lake which had not been managed, the formulation of a management program for Calder Lake and the possibility of limiting sunfish overpopulation by a combination of largemouth bass and redbreast sunfish.

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esolution of conflicts between forestry and fisheries requires assessment f stream habitat quality so that stream reaches of vulnerable or critical abitat may be avoided or protected. Assessment of stream habitats otentially involves a large number of stream features. Designers of stream urvey techniques must choose a subset of these features based on logistical onstraints of field work and intended use of the survey data. A new survey echnique, developed for use in southeast Alaska, is described. The echnique involves diagrammatic mapping of stream features, including water elocity/depth categories, spawning gravel, and several kinds of fish over.

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[Colo. Div. Wildl., 317 W. Prospect, Fort Collins 80526] Turquoise Lake a dimictic, cold-water reservoir that is well oxygenated, relativ unbuffered, and slightly acidic. Turquoise Lake may be classifie oligotrophic on the basis of total dissolved solids, algal nutrients ( and chlorophyll concentrations. Some oxygen depletion in the reservoir hypolimnion occurs regularly in late summer and late winter though seaso turnover and perhaps the outlet at the reservoir bottom prevents ano conditions from developing. Turquoise Lake is limnologically similar Twin Lakes in most aspects. Colder water temperatures and the introducti of *Tabellaria* and *Daphnia* in Turquoise Lake may have a noticeable upon the limnological character of Twin Lakes. The fishery at Turquoise is based on the stocked, creel-sized rainbow trout. Though similar to Lakes, a better catch rate for a similar fisherman effort and stocking exists. The stocked rainbow trout return in the harvest at a relatively level in one summer season but continue to contribute to the fishery in following season. Fall stocking of creel-sized rainbow trout also appe to be quite effective in providing good catch rates in the following spri Catch rates have remained relatively high despite increased fisher effort and similar levels of rainbow trout stocking between 1972-73 1980. In contrast to Twin Lakes, this may be a result of signific contributions to the fishery from a previous year's stock of fish, fal stocking and the absence of a significant population of lake trout. trout have been unable to establish a self-sustaining population in reservoir. Recruitment to a size capable of creating a fishery similar Twin Lakes and providing a predatory balance for the sucker populations negligible. Periodic stocking appears necessary to maintain a lake tro population in the reservoir. Turquoise Lake demonstrates potential for kokanee salmon fishery and egg source. Natural reproduction occurs in reservoir but water imports through the Homestake Tunnel during the fall winter period are necessary for spawning runs to occur in Lake Fork Creek.

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82-003000 Jones, A. R. THE "TWO-STORY" RAINBOW TROUT FISHERY AT LAUREL RIVER LAKE, KENTUCKY. *N. Am. J. Fish. Manage.* 2(2):132-137. 1982. SFA 27(4)
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## ESTUARY MANAGEMENT AND RESEARCH

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82-003002 Benson, N. G., (ed.). LIFE HISTORY REQUIREMENTS OF SELECTED FINFISH AND SHELLFISH IN MISSISSIPPI SOUND AND ADJACENT AREAS. *U.S. Fish Wildl. Serv.* FWS/OBS-81/51. 104p. Mar. 1982. Available @ $12.00 (paper) or $4.00 (microfiche) as order no. PB82-230699 from NTIS, 5285 Port Royal Rd., Springfield, VA 22161]

The published and unpublished literature on spawning, nursery, and migratory requirements of 41 finfish and shellfish species in Mississippi Sound, Mobile Bay, and adjacent waters was synthesized to assist the U.S. Army Corps of Engineers in planning dredging activities for navigation. Species were selected because of high abundance or significant value for recreational or commercial fishing. The primary ecological parameters considered were temperature, salinity, depth, substrate, turbidity, and current. Available data on habitats used by season and for spawning, nursery, or migration purposes are summarized. Food habits, distribution in water column (pelagic, demersal), and diurnal behavior are treated. The ecological role of each species in the ecosystem is discussed. Important sport and commercial species included were gulf menhaden, blue crab, spotted seatrout, Atlantic croaker, red drum, sand seatrout, spot, king mackerel, Spanish mackerel, and brown, white, and pink shrimp.

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ESTUARY MANAGEMENT AND RESEARCH (CONTINUED)

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AUTHOR INDEX

Aasted, D. C.
82-000496
Abbas, L. E.
82-000456
Abdel-Malek, S. A.
82-002007
82-002978
Abdullah, M. A. H.
82-002425
Abdullah, S.
82-002496
Able, K. W.
82-001206
82-001567
Ablett, R. F.
82-002214
Abraham, M.
82-002215
Acero P., A.
82-002668
Ackerman, R. A.
82-000652
Adachi, S.
82-002246
Adam, E.
82-001851
Adamek, Z.
82-000265
Adams, P. B.
82-000589
Adams, S. M.
82-002216
82-002530
Adamson, T. A.
82-002706
Addison, R. F.
82-000426
82-001383
82-001880
82-002262
Adelman, I. R.
82-001287
82-001648
82-002346
82-002567
Adkins, G.
82-002946
Adron, J. W.
82-000552
Aerts, P.
82-002121
Agius, C.
82-001792
82-001822
Agnello, R. J.
82-000679
Agrawal, V. P.
82-000670
Ahne, W.
82-001823

...CONTINUED...
Ahne, W.
82-001824
Aimar, C.
82-000137
Ajayi, T. O.
82-000901
82-002019
Akenhead, S.
82-001955
Akhmedov, A. M.
82-002831
Akhmedova, T. P.
82-002831
Akhramenko, A. K.
82-002295
Akiba, Y.
82-001219
Akimoto, N.
82-002088
Akiyama, T.
82-001326
82-002094
Aksiray, F.
82-001863
Al-Ahmed, T. A.
82-000558
Al-Hakbib, O. A. H.
82-000082
Al-Yamani, F. Y.
82-001840
Albert, S. G.
82-002217
Albrecht, H.
82-000174
Albright, J. T.
82-000132
Alcalde, C.
82-001063
Alderdice, D. F.
82-001981
Alderman, D. J.
82-000364
82-001048
82-002726
Alevizon, W. S.
82-000178
82-000816
Alexander, J. B.
82-001639
Ali, M. M.
82-001061
Allan, J. D.
82-002531
Allanson, B. R.
82-002392
Allen, A. N.
82-002123
Allen, C. H.
82-000006

# AUTHOR INDEX

Allen, J. R. M.
  82-001673
  82-002576
Allen, W. V.
  82-000006
Allendorf, F. W.
  82-000761
  82-001198
  82-001540
Almendras, J. M. E.
  82-001337
Altringham, J. D.
  82-000634
Altukhov, Y. P.
  82-000762
  82-000763
Altukhova, L. A.
  82-002220
Alvarez Cadena, J.
  82-002623
Alvarez Leon, R.
  82-001062
Alvarez-Lajonchere, L.
  82-000237
Alvarez-Pellitero, M. P.
  82-001806
  82-001807
Alvarez-Uria, M.
  82-002265
Ambak, M. A.
  82-002638
Amborski, R. L.
  82-001804
Amelung, H.
  82-001889
Amend, D. F.
  82-001793
  82-001794
  82-001849
  82-001890
  82-002098
Ames, W. E.
  82-002234
Amezcua-Linares, F.
  82-002452
  82-002612
  82-002613
Amidan, G.
  82-000036
Amin, O. M.
  82-002750
  82-002751
  82-002752
Amirkhanov, G. A.
  82-000083
Amthauer, R.
  82-001493
Anderson, B. C.
  82-001637
Anderson, L. G.
  82-000479
  82-001180
Anderson, N.
  82-000378
  82-000379
  82-000997
Anderson, R. N.
  82-002925
Anderson, W. D., Jr.
  82-000332
Andersson, I. B.
  82-001994
Andersson, H.
  82-000824
Ando, S.
  82-000635
Andreasson, J. K.
  82-001891
Andresen, P.
  82-002267
Andreucci, R. D.
  82-000590
Andrews, C.
  82-001789
  82-001808
  82-001841
Aneer, G.
  82-002476
Angermeier, P. L.
  82-001642
Anikiyeva, L. V.
  82-002718
Anna, C.
  82-001219
Annand, C.
  82-002775
Annigeri, G. G.
  82-002123
Anwar, A.
  82-001310
Aoki, I.
  82-002389
Aoki, N.
  82-000185
  82-002088
Appa Rao, T.
  82-002218
  82-002219
Applegate, R. L.
  82-000893
  82-002124
Appukuttan, K. K.
  82-002125
  82-002577
Appy, R. G.
  82-000380
  82-002715
  82-002775

# AUTHOR INDEX

Arai, K.
82-001422
Arai, N. N.
82-002532
Arai, S.
82-000882
Araki, Y.
82-002730
Aranamo, C. A. O.
82-001674
Araya, K.
82-002529
Archibald, C. P.
82-000575
82-000854
82-002972
Argyle, R. L.
82-001611
Arieli, Y.
82-000036
82-000560
82-002098
Arillo, A.
82-000421
82-002849
Armantrout, N. B.
82-001151
82-001152
Armo, C.
82-001073
Armstrong, R. J.
82-001647
Armstrong, M. S.
82-001334
Arnason, A. N.
82-001973
Arndt, R. G.
82-001641
Arnold, C. R.
82-000054
82-000330
Aro, E.
82-000858
82-000896
Arsu, V.
82-001133
Arrignon, J. C. V.
82-001278
Arthur, J. R.
82-001777
Asbury, K.
82-000300
Ashe, D. M.
82-003001
Ashton, C. E.
82-001643
Ashwood-Smith, M. J.
82-002107
Astakhov, D. A.
82-001977
Atkins, D. L.
82-002297
Atkinson, J. L.
82-001086
Atkinson, R. J. A.
82-000644
Atton, F. M.
82-001101
Au, R.-J.
82-000592
Austin, B.
82-000364
82-002726
Auvinen, H.
82-001240
82-001242
Avault, J. W., Jr.
82-000043
82-000504
Avnimelech, Y.
82-000534
Awakura, T.
82-002737
82-002753
Axell, M.
82-002533
Axelsen, F.
82-002447
Axon, J. R.
82-002998
Ayles, G. B.
82-000019
82-000020
82-001688
Azam, S. P.
82-002810
Azuma, M.
82-000207
Babcock, W. H.
82-001953
Baburina, V.
82-002173
Bacci, E.
82-002801
Bacher, G. J.
82-002788
Badcock, J.
82-000591
82-000998
Badenko, L. V.
82-002220
Badaha, K. S.
82-002787
Bagenal, T. B.
82-001228
Bagge, P.
82-000902
Baglin, R. E., Jr.
82-002677

Bahr, L. M., Jr.
82-002455
Bahuguna, S. N.
82-000901
Bailey, G. C.
82-000485
Bailey, R. M.
82-000981
82-001021
Bailey, R. S.
82-001612
Baird, T. A.
82-000671
Bakanov, A. I.
82-000279
Baker, B. I.
82-001450
82-002335
Baker, J. D.
82-001555
Baker, J. P.
82-001892
Baker, M. R.
82-002754
Bakkala, R. G.
82-001729
Bakthavathsalam, R.
82-002823
Bakun, A.
82-003008
Balan, V.
82-002614
Balasch, J.
82-001939
Balasubramanian, N. K.
82-000919
Balasubramanian, T. S.
82-002635
Balayev, L. A.
82-002221
Baldwin, J.
82-002251
82-002252
Ball, J. N.
82-000636
82-002210
Ball, R. L.
82-000944
Bally, R.
82-001144
Balon, E. K.
82-001623
Balsamo, M.
82-000818
Balsamo, J. S.
82-002384
Baltz, D. M.
82-001590
82-002390

...CONTINUED...
Baltz, D. M.
82-002639
Balushkin, A. V.
82-000337
Banarescu, P. M.
82-000349
Banerji, S. R.
82-000238
Banner, C. R.
82-002716
Bannikov, A. F.
82-002669
Bao, I. Y.
82-001384
Barahona-Fernandes, M. H.
82-002078
Barannikova, I. A.
82-002059
Barans, C. A.
82-002428
Barash, H.
82-000523
Barbeau, C.
82-002805
Barber, D.
82-002229
Barber, W. E.
82-002990
Barnett, C.
82-000791
Barnett, H.
82-001816
Baroni, A.
82-002743
Barrera, M.
82-002717
Barros, C.
82-001063
Barry, J. P.
82-001261
Barsukov, V. V.
82-002670
Bartell, S. M.
82-001644
Bartlett, G. R.
82-002222
Barton, B. A.
82-000422
82-000565
Barto[illegible] M.
82-[illegible]00792
Barton, M. G.
82-001645
Bartoo, R.
82-000328
Baruffaldi, A.
82-001475
Barua, V.
82-000086

Basak, P. K.
82-002824
Bastl, I.
82-002980
Bateman, D.
82-000320
Bath, H.
82-000333
82-000334
Batty, R. S.
82-003033
Baudin, J. P.
82-002825
Bauer, J. A., Jr.
82-000239
Bauer, S. E.
82-000239
Baugh, T. M.
82-000637
82-001333
82-002038
Baumgartner, J. V.
82-000999
Baylis, J. R.
82-001548
Bayne, D. R.
82-000581
Beacham, T. D.
82-001624
Beadles, J. K.
82-000525
Beamish, F. W. H.
82-000412
82-001124
82-002223
82-002708
Beamish, R. J.
82-000965
82-001749
82-002708
Bean, R. M.
82-001900
Beard, T. D.
82-001613
Beardmore, J. A.
82-001373
Beardsley, G. L.
82-000216
82-001597
Beaumont, W. R. C.
82-002126
Beaven, M.
82-000933
Beck, A. D.
82-002091
Beck, I.-M.
82-000385
Becker, C. D.
82-001084

...CONTINUED...
Becker, C. D.
82-001114
82-001170
82-002659
Becker, K.
82-001313
Bedgood, M. F.
82-002797
Beecher, H. A.
82-002515
Behmer, D. J.
82-000519
Behnke, R. J.
82-002671
Behrens Yamada, S.
82-001188
Behrens, W. J.
82-002047
Beitinger, T. L.
82-000177
82-000411
82-000798
82-001122
82-001420
82-001913
Bejarano, R.
82-000859
Bek, J. R.
00-000000
Bekker, V. E.
82-000335
82-002615
Beland, K. F.
82-002478
Belanger, S. E.
82-000952
82-001115
Bell, D. M.
82-002391
Bellan, G.
82-001893
Belokopytin, Y. S.
82-002224
Belova, N. V.
82-002225
Belyanina, T. N.
82-002127
Bemis, W. E.
82-001353
Ben-Tuvia, A.
82-002648
Benchakan, M.
82-002370
Benda, R. S.
82-002008
Benditt, E. P.
82-000427
Bendl, F. E.
82-002852

# AUTHOR INDEX

Bengart, G. A.
  82-001960
Benjamin, M.
  82-002120
Bennett, D. H.
  82-000860
Bennett, J. R.
  82-002005
Bennett, R. O.
  82-002826
Benson, J. A.
  82-002163
Benson, N. G.
  82-000492
  82-003002
Bentley, T. B.
  82-000793
Bercy, C.
  82-001979
Berg, B. A.
  82-001329
Berger, T. A.
  82-002998
Bergeron, T.
  82-001354
Bergersen, E. P.
  82-001954
  82-002115
Bergheim, A.
  82-001864
Bergman, H. L.
  82-001901
Bergman, P. K.
  82-001944
Berkes, F.
  82-002966
Berkowitz, E. J.
  82-001495
Bern, H. A.
  82-001385
  82-001412
  82-001457
  82-002239
Bernard, D. R.
  82-002516
Berns, S.
  82-001576
Berra, T. M.
  82-000592
  82-000636
Berry, C. R., Jr.
  82-000312
Berry, E. S.
  82-001935
Berst, A. H.
  82-001154
  82-001168
Bertelsen, E.
  82-001000
Berti, R.
  82-000181
Bertram, P. E.
  82-002103
Best, A. C. G.
  82-000593
Best, E. A.
  82-002656
Bettoli, P. V.
  82-001006
Beulig, A.
  82-000794
Beumer, J. P.
  82-002708
Beverley-Burton, M.
  82-000381
  82-001858
  82-002755
  82-002756
Beyer, J.
  82-003008
Bhaskar, N.
  82-000431
Bhattacharya, S.
  82-000707
Bhattacharyya, T. K.
  82-000594
Bhesania, T.
  82-002269
Bhowmick, R. M.
  82-002060
Bialokoz, W.
  82-001646
Biberman, L. J.
  82-001442
Bielak, E.
  82-000885
Bieniarz, K.
  82-000526
  82-002240
Bietts, R. M.
  82-000830
Bigelow, S. M.
  82-000579
Bigott, K.
  82-001828
Billard, R.
  82-000086
  82-000515
  82-000639
  82-000640
  82-000641
  82-000669
  82-001386
  82-002244
  82-002479
Bills, T. D.
  82-002827
Billy, A. J.
  82-003026

# AUTHOR INDEX

Bilton, S. T.
82-001976
82-001980
82-001981
Binder, D. L.
82-002914
Binkowski, F. W.
82-001461
Binns, N. A.
82-000831
82-002893
Bird, D. J.
82-000087
Bird, F.
82-002947
Birman, I. B.
82-002680
Birnie, S. E.
82-000392
Bishop, C. A.
82-001983
Bister, H.
82-001928
Biswas, N.
82-000138
Bjerknes, V.
82-002915
Blaber, S. J. M.
82-000044
82-001702
82-001886
82-002537
82-002679
Black, C. A.
82-000460
Blackie, J. R.
82-001171
Blackstock, M.
82-002226
Blair, A.
82-002104
Blake, R. L.
82-000003
Blanc, J. M.
82-000158
82-000648
82-002373
Blanter, J. M. S.
82-000175
82-000176
82-000616
Blay, J., Jr.
82-002534
Blazer, V. S.
82-002844
Blechmann, N.
82-000842
Bledsoe, L. J.
82-002029

Blight, S.
82-002655
Blouw, D. M.
82-000045
Blumer, L. S.
82-001548
Blythe, R. H.
82-001871
Bobbitt, J.
82-001955
Bodaly, R. A.
82-000575
Boehlert, G. W.
82-000946
Boehmke, J. R.
82-000576
82-002814
Boem, P. D.
82-002797
Boese, B. L.
82-001135
Bohemen, C. G. van
82-000643
Bohnsack, J. A.
82-000904
Bok, A. H.
82-002061
Bolan, K.
82-000666
Bonstes, A. B.
82-002828
Bond, C. E.
82-000850
Bond, J.
82-000427
Bondari, K.
82-000524
Boney, S. E.
82-002105
Booke, H. E.
82-000772
82-000777
82-001155
Booker, O. J.
82-001049
Boord, R. L.
82-001355
Booth, J. H.
82-001894
Boss, G. W.
82-001483
Borg, B.
82-001307
82-002227
Borgese, J. M.
82-001388
Borgese, T. A.
82-001388
Borgeson, D.
82-000784

Borgeson, D. F.
  82-001229
Borgmann, U.
  82-001614
Borgstrom, R.
  82-000270
Borodulina, O. D.
  82-000335
  82-002672
Borrero, M.
  82-002486
Bosch, H.
  82-000108
Bottroff, L. M.
  82-001175
Bouck, G. R.
  82-002039
Bourgeois, M. J.
  82-002946
Bovo, G.
  82-002763
Bowen, S. H.
  82-002392
Bower, C. E.
  82-000566
  82-002074
  82-002101
Bowering, R.
  82-002467
  82-002467
Bowering, W. R.
  82-001356
Bowers, A.
  82-001039
Bowne, P. S.
  82-000595
Bowser, P. R.
  82-001050
Boxrucker, J. C.
  82-002931
Boyd, C. E.
  82-000503
  82-001216
  82-001272
  82-001289
  82-001334
  82-002062
  82-002113
Boyev, A. A.
  82-002059
Bracken, B. E.
  82-001635
Brader, J. D.
  82-001389
Bradley, R. L.
  82-002816
Bradstreet, M. S. W.
  82-001550
Brady, D. R.
  82-001390
Braekkan, O. R.
  82-000145
  82-001451
Braid, M. R.
  82-000013
Brammer, J. D.
  82-001902
Brams, P.
  82-002267
Branchek, T. A.
  82-000596
Brannon, E. L.
  82-000827
Branstetter, S.
  82-000301
  82-001750
Brassard, P.
  82-002757
Brauhn, J. L.
  82-002871
Bravo-Hollis, M.
  82-002758
Bravo-Nunez, E.
  82-002616
Brawn, V. M.
  82-000875
Brazier, O.
  82-001551
Breazile, J. E.
  82-002228
Bregazzi, P. R.
  82-001090
Brege, D. A.
  82-000285
Bremner, B. C.
  82-001983
Breton, B.
  82-000641
  82-000669
  82-001413
Brett, B. L. H.
  82-000795
  82-000796
Brewer, K.
  82-000313
Bridges, C. R.
  82-000644
Briggs, H.
  82-001221
Brigham, W. U.
  82-001966
Brighenti, L.
  82-001475
Bright, G. R.
  82-001703
Brill, R. W.
  82-002020
Britski, H. A.
  82-000590

# AUTHOR INDEX

Brittain, T.
82-002229
Britton, R. H.
82-001647
Brommark, C.
82-000925
Bronstein, P. M.
82-001625
Bronzi, P.
82-000672
Brooke, L. T.
82-001137
Brooks, A. S.
82-002103
Brooks, D. R.
82-000386
Brooks, M. J.
82-001288
82-002378
Brooks, P.
82-002885
Broussard, W.
82-002770
Browder, J. A.
82-000454
Brown, A. C.
82-001275
Brown, A. F.
82-000769
Brown, C. L.
82-001391
Brown, D. J. A.
82-001895
82-001896
Brown, E. H., Jr.
82-000568
82-001230
Brown, J. A.
82-000336
Brown, L.
82-001636
82-002481
Brown, L. R.
82-000959
82-002535
Brown, S. B.
82-002393
Brown, S. W.
82-001289
Browne, D.
82-001528
Bruce, W. J.
82-000962
Brummett, A. R.
82-001357
Brundage, H. M. III
82-002617
Bruno, D. W.
82-001790
Brunson, K.
82-002618
Brunson, M. W.
82-000857
Brusher, H. A.
82-000099
Brussard, P. F.
82-000764
Brusven, M. A.
82-000266
Bry, C.
82-001290
Bryant, P. C.
82-002865
Buch, A. U.
82-003009
Buchanan, T. M.
82-001704
Buck, R. J. G.
82-000891
Bucke, D.
82-001825
Buckley, J. T.
82-000090
82-001897
82-001923
Buckley, L. J.
82-000645
Buckley, R. M.
82-002894
Buckner, R. L.
82-002777
Bugayev, V. F.
82-002129
Bullock, L. H.
82-002619
Bullock, T. H.
82-000746
Bundgaard, H.
82-002130
Burdak, V. D.
82-002131
Burger, E. H.
82-001433
Burgess, J. W.
82-000797
82-001898
Burggren, W.
82-001489
Burggren, W. W.
82-002230
Burke, J.
82-002744
Burke, J. A.
82-001826
Burnham, K. P.
82-002989
Burns, J. R.
82-000051

# AUTHOR INDEX

Burr, B. N.
  82-000618
  82-000832
  82-001605
  82-002420
Burress, R. M.
  82-002867
Bursey, C. R.
  82-002759
Burt, M. D. B.
  82-000382
  82-002715
Burton, D.
  82-002798
Burton, D. T.
  82-000436
Burzawa-Gerard, E.
  82-000646
  82-000740
Busakhin, S. V.
  82-001001
Buschbom, R. L.
  82-000159
Bushman, L. G.
  82-002718
Bushnell, P. G.
  82-002231
Bussing, W. A.
  82-001751
Buth, D. G.
  82-000765
  82-001523
  82-001527
Butler, D. G.
  82-000594
Butler, J. L.
  82-000068
Butler, M. J. IV
  82-001348
Butler, P. J.
  82-002313
Butler, S. A.
  82-001745
Butler, W.
  82-000787
Butskaya, N. A.
  82-000088
Butterworth, B. C.
  82-000406
Buttner, J. K.
  82-000015
Buynak, G. L.
  82-000877
Buzeta, M.
  82-002482
Bwathondi, P. O. J.
  82-001304
Byars, J.
  82-000461
Cabling, F., Jr.
  82-001392
Cada, G. F.
  82-001984
Cadieux, C.
  82-000991
Cailliet, G. M.
  82-000947
  82-001261
Cairns, J., Jr.
  82-001091
  82-001469
  82-002004
Cairns, M. A.
  82-001116
Calhoun, S. W.
  82-000177
  82-000798
Call, D. J.
  82-002845
Callard, G. V.
  82-000695
Cameron, D. G.
  82-001528
Cameron, J. N.
  82-002232
  82-002233
Campagna, C. G.
  82-000089
Campana, S. E.
  82-002578
  82-002947
Campbell, G.
  82-002254
Campbell, J.
  82-000367
Campbell, K. L. I.
  82-001705
Campbell, R.
  82-002104
Campbell, R. A.
  82-000387
  82-002760
  82-002761
Campbell, S. G.
  82-000576
Cange, S.
  82-000504
Cann, D. C.
  82-002727
Canto, J. T., Jr.
  82-001337
Capape, C.
  82-002132
Caplins, W. C.
  82-001220
Capper, B. S.
  82-000550
  82-002077

...CONTINUED...
Capper, B. S.
82-002089
Cardeilhac, P. T.
82-000420
Cardenete, G.
82-000728
Cardenette, G.
82-000131
Carey, F. G.
82-001551
Carignan, R.
82-000560
Carl, L. M.
82-002984
Carlander, K. D.
82-001675
Carlberg, G. E.
82-000433
Carline, R. F.
82-000922
Carling, P. A.
82-000256
Carlisle, T. R.
82-000876
Carlson, C. A.
82-001273
Carlson, D. M.
82-002374
Carmack, E. C.
82-000040
Carmichael, G. J.
82-001899
Carneiro, J.
82-000590
Carpene, E.
82-001393
Carpenter, A. C.
82-001854
Carr, B. A.
82-000505
Carr, W. E.
82-000420
Carranza, F.
82-001270
Carrillo, M.
82-001311
Carroll, J.
82-000451
Carson, D. O.
82-001846
82-001847
Carter, A.
82-001704
Carter, J. S.
82-000377
Carvajal G., J.
82-002782
Carvajal, J.
82-001063
Casanova, K. L.
82-002528
Casey, J. G.
82-001551
Cashner, R. C.
82-002673
Cashon, R. E.
82-000766
Casillas, E.
82-002234
Casselman, J. M.
82-000767
82-000772
Cassia, M. C.
82-002483
Castagnoli, N.
82-002305
Castanet, J.
82-002172
Casterlin, M. E.
82-000196
82-000799
82-000817
82-001486
82-002411
Castledine, A. J.
82-000090
Castonguay, M.
82-002235
Castric, J.
82-001058
Cattani, O.
82-002792
Cavender, T. M.
82-002606
Ceccaldi, H. J.
82-002052
Cech, J. J., Jr.
82-000089
82-000647
82-000959
82-001163
82-002361
Cerri, R. D.
82-001679
Ceschia, G.
82-001044
Chadwick, E. M. P.
82-000962
82-002968
Chakraborty, R.
82-002375
Chakroff, M. S.
82-000506
Chamberlain, J. B.
82-000676
Chambolle, P.
82-001438
Chan, G.
82-000373

# AUTHOR INDEX

Chan, G. L.
82-001082
Chanchal, A. K.
82-002597
Chandra, K.
82-000022
Chaney, E.
82-000264
82-000486
Chang, J. P.
82-001401
Chang, K.-Y.
82-000442
Chang, W. Y. B.
82-002579
Chang, Y.
82-002236
Changdong, G.
82-001842
Changlin, L.
82-001350
Chapman, D. E.
82-001135
Chapman, D. G.
82-001986
Chapman, D. J.
82-000396
82-000404
82-000415
82-000416
Chappell, J. A.
82-001288
82-002378
Charlon, N.
82-000648
Chase, R.
82-000093
Chase, V. C.
82-002401
Chau, Y. K.
82-001940
Chaudhry, M. A.
82-002311
Chebanov, N. A.
82-000240
Cheeseman, C. L.
82-001974
Chen, C.
82-000241
Chereshnev, I. A.
82-000337
Chernitskiy, A. G.
82-002237
Chernoff, B.
82-000338
82-001002
82-002674
82-002675
Cherry, D. S.
82-001091
Chervinski, J.
82-000569
82-001305
Cheung, P. F.
82-001809
Cheung, P. J.
82-001064
Chevassus, B.
82-002373
Chhaya, N. D.
82-003009
Chien, Y.-H.
82-000043
Chikhacheva, V. P.
82-002220
Childers, W. F.
82-000778
82-002936
Chilton, D. E.
82-000945
Ching, H. L.
82-001065
Chittenden, M. E., Jr.
82-000148
82-000847
Chiu, M. T.
82-002821
Cho, C. Y.
82-000408
Chonder, S. L.
82-002133
Choubert, G.
82-003027
Choudhury, R. C.
82-002376
Chrisman, C. L.
82-000789
82-000790
Christensen, B. M.
82-001843
Christensen, N. O.
82-001778
Christian, J. J.
82-002404
Christiansen, B.
82-001394
Christie, A. E.
82-000393
Christie, P.
82-000722
Christie, W. J.
82-000837
82-002684
Chua, T. E.
82-001306
Chubb, C. F.
82-000286
Chung, K. S.
82-001092

# AUTHOR INDEX

...CONTINUED...
Chung, K. S.
  82-002238
Cianfanelli, A.
  82-000181
Cichra, C. E.
  82-000649
  82-001254
Ciechomski, J. D. de
  82-000242
  82-000243
  82-002483
Ciepielewski, W.
  82-001615
Cilia, A.
  82-001064
Cincotta, D. A.
  82-001865
Cipriano, R. C.
  82-000365
  82-001040
  82-001041
  82-001042
  82-002728
Clady, M. D.
  82-000267
  82-000897
  82-001653
Claiborne, J. B.
  82-000650
  82-002259
Claiborne, J. B. III
  82-001395
Clark, B.
  82-001524
Clark, D. T.
  82-000800
Clark, M. R.
  82-000302
Clarke, A.
  82-000256
Clarke, L. A.
  82-001552
Clarke, W. C.
  82-002085
Clay, D.
  82-002134
  82-002580
Clay, H.
  82-002134
  82-002580
Clayton, D. A.
  82-000801
Clayton, J. W.
  82-000857
Cliff, G. M.
  82-002655
Cloutman, D. G.
  82-000374
Clugston, J. P.
  82-001172
Coad, B. W.
  82-000339
  82-001003
Coates-Markle, L. J.
  82-002429
Coates, D.
  82-001626
Coates, L. J.
  82-000805
Coberly, C. E.
  82-001230
Coble, D. W.
  82-002789
  82-002955
Coche, A. G.
  82-001279
  82-002045
  82-002053
Cochran, P. A.
  82-001648
Cohen, A. H.
  82-000651
Cohen, D. M.
  82-000303
  82-001004
  82-002676
Coke, M.
  82-001706
Colby, P. J.
  82-000768
Cole, K. S.
  82-002484
Cole, W. C.
  82-000091
  82-002135
Coleman, F.
  82-000092
Coles, T. F.
  82-000781
Colgan, P. W.
  82-000336
  82-001117
Colin, P. L.
  82-002136
Collette, B. B.
  82-001752
  82-002677
Collie, N. L.
  82-002239
Collins, B. W.
  82-001676
Collins, J. J.
  82-000767
Collins, J. P.
  82-000327
  82-000987
Colombo Belvedere, P.
  82-002240
Colombo, L.
  82-002240

# AUTHOR INDEX

Colorni, A.
82-002746
Colt, J.
82-001335
Colton, D. E.
82-000178
Colwell, S. T.
82-001730
Comas, J. F.
82-000495
Combe, D. L.
82-001256
82-002517
Compagno, L. J. V.
82-000623
82-000834
82-001374
82-002678
Conder, A. L.
82-002695
Cone, D. K.
82-000382
82-000383
82-001057
82-001066
Congo, R.
82-002051
Conklin, R. B.
82-002438
Connell, J. J.
82-002872
Conner, J. R.
82-000496
Connolly, J. P.
82-002790
Conover, D. O.
82-001741
82-002518
Conrad, J. F.
82-001043
Conroy, D. A.
82-000362
Cook, C. M.
82-001968
Cook, R. C.
82-001359
Cooke, D. W.
82-003003
Coombe, C.
82-000858
Coombe, S.
82-001360
82-001553
Coombe, T. L.
82-002356
Coons, L. B.
82-001811
Cooper, J.
82-002393
Cooper, J. J.
82-002485
Cooper, M.
82-000227
Cooper, M. J.
82-000221
Cooper, R. A.
82-001547
Cooper, S. D.
82-000580
Cope, O. B.
82-000440
Copeland, D. E.
82-002137
Copeland, P.
82-002301
Copes, F. A.
82-002932
Copland, J. W.
82-002736
Corazza, L.
82-000047
Corcoran, M. F.
82-001005
Corey, S.
82-000585
Corley, S.
82-002955
Cornacchia, J. W.
82-002241
Correia, S. J.
82-002760
Costa, J. R. V.
82-002305
Cotrina, C. P.
82-002138
Cottle, J.
82-000385
Courtois, L. A.
82-001173
Courtois, R.
82-002536
Cousseau, M. B.
82-002138
Coutant, C. C.
82-001998
Cowey, C. B.
82-000552
82-002242
82-002371
Cowie, B.
82-000487
Coyer, J. A.
82-000180
82-001627
Coyula, R.
82-002663
Crabtree, C. B.
82-001523

# AUTHOR INDEX

Crabtree, R. E.
82-000963
82-001628
Craig, D.
82-002421
Craig, J. F.
82-001616
82-001985
Craig, P. C.
82-001591
Crandall, T. A.
82-001050
Crane, J. M., Jr.
82-000208
Crepon de Caprona, M.-D.
82-001629
Crass, D. W.
82-001114
82-002139
Crateau, E. J.
82-000209
82-002656
Cravedi, J. P.
82-001093
Crawford, T. G.
82-000525
Crenshaw, L. I.
82-000652
82-002243
Crespo, S.
82-001939
Cresswell, G. R.
82-000316
Crim, L. W.
82-000653
82-002244
Crisetig, G.
82-002791
82-002792
Crisp, D. T.
82-002114
Crist, L.
82-000906
Crites, J. L.
82-001074
Crone, R. A.
82-000516
Cross, F. B.
82-000770
Cross, J. A.
82-001117
Crossman, E. J.
82-000767
Crouse, M.
82-001152
Crowder, L. B.
82-000282
82-002394
Croy, T. R.
82-002099
Cruz, M.
82-002327
Cruz, T. A.
82-002377
Cuker, B. E.
82-000867
Culp, J. M.
82-002119
82-002120
Cupp, J. K.
82-002763
Curiel-Gomez, J.
82-002450
Current, W. L.
82-001049
Curtis, C.
82-002845
Curtis, M. A.
82-002757
Cushing, D. H.
82-001997
Cyrus, D. P.
82-000044
82-001702
82-002537
82-002679
Czarnocki, J.
82-002078
Czygan, F.-C.
82-001396
D'Attellis, C. E.
82-002969
D'yakov, Y. P.
82-002140
Daborn, G. R.
82-002546
Dabrowski, K.
82-000542
82-000654
82-000655
82-001312
82-002078
82-002245
82-002246
82-002290
Dadzie, S.
82-001291
Daikoku, T.
82-002247
Dailey, D. C.
82-000972
Dailey, J. T.
82-000972
Dailey, M. D.
82-001844
82-002720
Dalela, R. C.
82-000418
Daley, R. J.
82-000040

Dalsgaard, I.
82-001965
Daly, J. G.
82-001803
Damas, T.
82-002406
Damianakis, H.
82-000170
Dan, S. S.
82-002487
82-002488
82-002559
82-002561
Dange, A. D.
82-002829
Dangschat, H.
82-001813
Daniels, R. A.
82-000964
82-002639
Danker, S. A.
82-002538
Daoulas, C.
82-001687
Darcy, G. H.
82-000268
Darling, J. D. S.
82-000943
Darracott, D. A.
82-001275
Das, C. C.
82-002376
Das, S. M.
82-002793
Dasgupta, J. D.
82-000597
Dashow, L.
82-001391
82-002289
Dauble, D. D.
82-000159
82-001900
Daud, S. K. B.
82-002141
Daugherty, C. H.
82-000769
Davie, P. S.
82-000656
82-001397
Davies, A. J.
82-002738
Davies, D. S.
82-001307
Davies, I. J.
82-000586
Davies, R. M.
82-001174
Davies, R. W.
82-001800
...CONTINUED...
Davies, R. W.
82-002119
82-002120
Davies, W. D.
82-001226
Davis, B.
82-001525
Davis, J. C.
82-000454
Davis, K. B.
82-001511
Davis, P. S.
82-001707
82-001933
Davis, R. E.
82-000093
Davison, W.
82-000046
Dawe, M.
82-001914
82-002467
82-002667
Dawson, C. E.
82-001006
82-001007
82-001753
82-001754
82-002680
82-002681
Dawson, C. P.
82-002926
Dawson, V. K.
82-001943
82-002868
Daxboeck, C.
82-000657
82-001397
82-001404
82-002248
Day, E. J.
82-000557
Day, J. W., Jr.
82-002455
Day, M. E.
82-000179
De Achaval, Z. C.
82-002249
De Kinkelin, P.
82-001050
De La Noue, J.
82-003027
De Leon, N. E.
82-002582
De Luca, P. H.
82-002249
De Martini, E. E.
82-000180
82-000244
De Ruiter, A. J. H.
82-001398

# AUTHOR INDEX

De Silva, S. S.
82-001008
De Wilde-Van Berge Henegouwen, M.
82-001515
De Yanez, V. L.
82-002208
82-002450
Deacon, J. E.
82-003988
Dean, J. C.
82-002079
Dean, J. M.
82-000253
82-000629
82-000963
82-001701
DeAngelis, D. L.
82-001998
Deardorff, T. L.
82-002764
Deaton, M. L.
82-002004
Deelder, C. L.
82-000287
Deelstra, H. A.
82-001399
DeGraeve, G. M.
82-001866
82-001901
82-002794
Deguchi, Y.
82-002349
82-002350
Dehadrai, P. V.
82-001925
Dehring, T. R.
82-000769
82-001198
Delage, A.
82-001223
Delfino, J. J.
82-001141
Delgado, S.
82-002013
Della Corte, F.
82-000721
Delorme, L. D.
82-002116
Demayo, A.
82-001143
82-002830
Demina, A. G.
82-000288
Demir, N.
82-002142
Demory, R. L.
82-000954
Demaki, L. S.
82-000598
...CONTINUED...
Demaki, L. S.
82-000658
Denner, M. W.
82-000972
Denoncourt, R. F.
82-002799
Denton, E. J.
82-000175
Deriso, R. B.
82-002873
Deshimaru, O.
82-002080
82-002081
DesJardine, R. L.
82-000837
82-001199
Desser, S. S.
82-002765
Detollenaere, A.
82-000407
Devadoss, P.
82-002422
82-002489
82-002539
82-002540
82-002916
82-003019
Devi, A. P.
82-001926
deVlaming, V. L.
82-001420
Devlin, E. W.
82-001902
DeVries, A. L.
82-000717
82-001470
82-001556
DeVries, D. A.
82-001265
Dewey, M. R.
82-002519
DeWitt, H. H.
82-000304
Dhage, K. P.
82-002250
Dharmaraja, S. K.
82-002921
Dheer, T. R.
82-001456
Dhulkhed, M. H.
82-002063
82-002457
82-002583
Dia, A. K.
82-001292
Diana, J. S.
82-000659
Diaz Luna, J. L.
82-001009

# AUTHOR INDEX

Diaz-Gonzales, G.
  82-002574
Diaz-Machuca, J. L.
  82-000833
Dick, T. A.
  82-001067
Dickman, K. G.
  82-001685
Dickson, D. H.
  82-002143
Dickson, T. A.
  82-002937
DiJulio, D.
  82-001121
Dill, L. M.
  82-000269
  82-001223
Dillmann, D. W.
  82-000645
Dimaline, R.
  82-000686
DiMattio, J.
  82-000660
DiMichele, L.
  82-001400
Dimmick, J. F.
  82-001682
Dindo, J. J.
  82-000123
Dirin-Khalturin, D. K.
  82-002584
Divanach, P.
  82-001319
  82-001361
  82-001570
  82-002075
  82-002548
Dixon, D. G.
  82-000423
  82-001912
  82-002837
Dixon, K. R.
  82-001880
Dixon, P. F.
  82-001827
Djabali, M.
  82-000094
  82-000661
  82-000720
Do, T. T.
  82-001851
Dobbe, F.
  82-001513
  82-002359
Dobson, G. P.
  82-002251
  82-002252
Dodd, J. M.
  82-002253

...CONTINUED...
Dodd, J. M.
  82-002284
Dodd, M. H. I.
  82-002253
Dodge, D. P.
  82-000830
Dodson, J. J.
  82-002430
  82-002435
  82-002536
Doi, A.
  82-002509
Doi, M.
  82-001336
Dominguez, R.
  82-000293
Donald, J.
  82-002254
Donaldson, E. M.
  82-000007
  82-000008
  82-000009
  82-000429
  82-000570
  82-001285
  82-001533
  82-002385
Doneen, B. A.
  82-000662
Donohoe, C. J.
  82-000892
  82-003003
Dooley, J. K.
  82-000340
  82-001014
  82-002826
Dorofeyeva, Ye. A.
  82-000341
Dorr, J. A. III
  82-002490
Dorsa, W. J.
  82-002082
Dosanjh, B. S.
  82-002085
Dotson, T.
  82-002874
Doucet, G. J.
  82-001077
Doucette, A. J., Jr.
  82-000162
Douglas, R. H.
  82-000599
  82-000802
Douglas, W. A.
  82-000230
Douthwaite, R. J.
  82-001102
Dovel, W. L.
  82-001698

## AUTHOR INDEX

Dowling, R. M.
82-000320
Downer, P.
82-001554
Downhower, J. F.
82-001636
82-002481
Drangsholt, H.
82-000433
Drenner, R. W.
82-000770
82-000907
82-000908
82-000937
82-001657
Drewry, G. E.
82-000933
Dronen, N. O., Jr.
82-001068
82-001852
Druzhinin, A. D.
82-000210
Du Buit, M. H.
82-001649
Dubin, R. E.
82-000803
82-001555
DuBois, A. B.
82-000718
82-001576
Dubois, M. P.
82-001438
Dubourg, P.
82-001438
DuBowy, V. S.
82-001708
Dubrovin, V. N.
82-002195
Duda, M. J.
82-002810
Dudley, D. R.
82-001747
Duedall, I. W.
82-002913
Dufford, D. W.
82-001966
Dugas, R.
82-002896
Duggal, C. L.
82-002768
Dumont, J. N.
82-001357
Dumont, P.
82-000991
82-002620
Dunant, Y.
82-000663
Dunham, R. A.
82-001288

...CONTINUED...
Dunham, R. A.
82-001293
82-002378
Dunkley, D. A.
82-002040
Dunn, J. F.
82-000046
Dunn, J. L.
82-001707
Dunning, D. J.
82-002927
Dupuis, H. M. C.
82-002491
Durand, J. R.
82-002018
Durbin, A. G.
82-000664
Durbin, E. G.
82-000664
Durocher, P. P.
82-001690
Durve, V. S.
82-002729
Dusaynski, D. W.
82-002742
Duszynski, D. W.
82-001819
Duthie, G. G.
82-002255
Dutil, J.-D.
82-000990
Dutta, H. M.
82-001118
Dye, H. M.
82-000007
82-000008
82-000009
82-000429
Dykova, I.
82-001815
Dzhavelidze, Y. G.
82-002847
Dzhumaliyev, M. K.
82-002144
Eagle, R. A.
82-001879
82-002817
Eales, J. G.
82-000095
82-000665
82-000702
82-001401
82-002325
Early, G.
82-002755
Eastcott, A.
82-001672
Eastman, J. T.
82-001402

...CONTINUED...
Eastman, J. T.
82-001556
82-002686
Eaton, R. C.
82-001557
Ebener, M. P.
82-002932
Echelle, A. A.
82-002682
Eck, G. W.
82-001230
Eckhardt, O.
82-001313
Eckmayer, W. J.
82-002621
Economidis, P. S.
82-000170
Eddy, B.
82-001921
Edgell, P. R.
82-001533
Edmonds, J. S.
82-001867
Edsall, C. C.
82-000989
Edwards, A. J.
82-000965
Edwards, T. J.
82-000211
82-000399
Edwards, T. W.
82-000096
Eggers, D. M.
82-001986
Egginton, S.
82-000600
Egglishaw, H. J.
82-002395
Egusa, S.
82-000388
Ehrlich, K. F.
82-001403
Ehrlich, M. D.
82-000242
82-000243
Eicher, G. J.
82-001995
Eie, J. A.
82-000270
Eiras, J. C.
82-001362
Eiserman, F. M.
82-002875
Eisler, R.
82-001903
Eklund, M. W.
82-001043
Ekstrom, P.
82-002145

...CONTINUED...
Ekstrom, P.
82-002256
El-Sayed, N.
82-002192
El-Zeiny, M.
82-001310
Elarifi, A. E.
82-002766
Elder, R. G.
82-001901
Eley, R.
82-000451
Elger, M.
82-000097
Eliassen, J.-E.
82-001404
82-001405
Ellertsen, B.
82-000909
Ellgaard, E. G.
82-002832
Elliot, D. G.
82-001890
Elliott, S. T.
82-000328
Ellis, A. E.
82-001498
82-001810
Ellis, M. J.
82-000098
Ellison, J. P.
82-002938
Ellory, J. C.
82-001470
Elner, J. K.
82-001149
Elovenko, V. N.
82-000342
Elsarnagawy, D.
82-001032
Elston, R.
82-000047
Emdin, S. O.
82-002257
82-002258
Emerson, S. V.
82-002876
Emery, A. R.
82-001010
Emmett, R. L.
82-001650
Endo, M.
82-001406
Engelhardt, F. R.
82-001129
Engelhardt, T.
82-001294
Engelman, R. W.
82-000384

# AUTHOR INDEX

Enomoto, A.
  82-002349
Enzmann, P.-J.
  82-001828
Epler, P.
  82-000526
  82-002240
Epple, A.
  82-002289
Epple, A. W.
  82-001391
Ercolini, A.
  82-000181
Erdheim, E.
  82-001156
Eriksson, L.-O.
  82-000160
Erman, D. C.
  82-002556
Ernst, M. E.
  82-000966
Ertl, M.
  82-002988
Erwteman-ooms, E. E. A.
  82-001089
Esquerda, J. E.
  82-000149
Eurell, J. A.
  82-002146
Evans, D. H.
  82-000650
  82-001407
  82-002259
Evans, D. O.
  82-000837
  82-001160
  82-001199
Evans, G. T.
  82-002970
Evans, R.
  82-002078
Evans, W. A.
  82-001244
Evenson, E. J.
  82-000543
Everest, F. H.
  82-002041
Eversole, A. G.
  82-002739
Ewel, K. C.
  82-002050
Ewing, M. S.
  82-001904
Ewing, S. A.
  82-001904
Eyeson, K. N.
  82-002534
Ezeasor, D. N.
  82-000048
...CONTINUED...
Ezeasor, D. N.
  82-000601
Ezenwa, B.
  82-001314
Ezzi, I. A.
  82-000212
Faas, L. F.
  82-001910
Fable, W. A., Jr.
  82-000054
  82-000099
Fadeyeva, T. A.
  82-000245
  82-002472
Fagade, S. O.
  82-000910
Fahy, W. E.
  82-001363
Faivre, B.
  82-002733
Fajer, E.
  82-002717
Fallo, G. J.
  82-002622
Fallon, W. E.
  82-001900
Fange, R.
  82-000602
  82-001372
  82-001408
FAO of the UN
  82-001266
  82-001276
  82-001526
  82-001945
  82-001946
  82-001967
  82-002022
  82-002023
  82-002024
  82-002025
  82-002037
  82-002046
  82-002054
  82-003037
Farlinger, S. P.
  82-000318
Farman, R. S.
  82-003028
Farmer, L.
  82-002259
Farquhar, B. W.
  82-001254
  82-002015
Farr, J. A.
  82-000771
Farwell, C. J.
  82-000038
Fast, A. W.
  82-001175

# AUTHOR INDEX

Faus, M. J.
  82-002320
Fausch, K. D.
  82-000182
  82-001651
Favaretto, A. L. V.
  82-000100
Favro, D. D.
  82-002379
Favro, L. D.
  82-002379
Fay, R. R.
  82-000666
  82-001558
  82-002396
Featherston, D. W.
  82-002773
Fechhelm, J. D.
  82-002698
Fechhelm, R. G.
  82-000107
Fel'dman, V. N.
  82-002147
Felhaber, T. A.
  82-002845
Felton, S. P.
  82-001121
Fendrick, J. L.
  82-001059
Ferguson, A. J. D.
  82-000584
Ferguson, H. W.
  82-001124
  82-002277
Ferguson, M. M.
  82-000161
Fernald, R. D.
  82-001364
  82-002263
Fernandes, B. M. M.
  82-001853
Fernando, C. H.
  82-001082
Fernholm, B.
  82-001755
Ferraris, C. J., Jr.
  82-000317
  82-001677
Ferri, S.
  82-000049
  82-002148
  82-002828
Ferris, S. D.
  82-001527
Ferro, R. S. T.
  82-001204
  82-001205
Fetterolf, C. M., Jr.
  82-001231
Fiandt, J. T.
  82-001120
  82-001930
Fickeisen, D. H.
  82-001094
  82-001170
  82-002659
Field, D. W.
  82-002739
Figueroa, H. R.
  82-001420
  82-002274
Filipek, S.
  82-001187
Filosa, M. F.
  82-002260
Finger, T. E.
  82-002149
Finger, T. R.
  82-002397
Fink, W. L.
  82-000603
Finlayson, B. J.
  82-002833
Finlayson, J. E.
  82-001069
Finnegan, J., Jr.
  82-000099
Finnell, L. M.
  82-000452
Finucane, J. H.
  82-000123
Fischer, J. M.
  82-000394
Fischer, M.
  82-002896
Fischthal, J. H.
  82-001846
  82-001847
  82-001848
Fisher, J. E.
  82-001678
Fisher, J. W.
  82-000426
Fisher, M. M.
  82-002260
Fisher, P. W.
  82-001528
Fisher, S. E.
  82-002374
Fisher, T. R.
  82-001216
Fithian, P. S.
  82-002026
FitzGerald, G. J.
  82-000941
  82-000990
  82-002235
  82-002421

# AUTHOR INDEX

...CONTINUED...
FitzGerald, G. J.
82-002427
Fitzgerald, M. E. C.
82-001811
Fitzsimons, J. M.
82-000162
82-002150
Flagg, P. J.
82-002047
Flain, M.
82-001617
Flanagan, C. A.
82-000183
Flemming, B.
82-001906
Flescher, D. D.
82-000604
Fletcher, G. L.
82-000106
82-000665
82-000667
82-002261
82-002262
Fletcher, J. M.
82-001985
Fletcher, R. I.
82-002971
Fletcher, T. C.
82-002365
Flick, W. A.
82-001203
Flickinger, S. A.
82-000564
Flint, A. P. F.
82-000730
Flores-Coto, C.
82-002623
Flores, J. A.
82-000051
Fluck, R. A.
82-001409
Flynn, J. K.
82-001793
82-001794
Focardi, S.
82-002801
Foell, E. J.
82-000809
82-002802
Follenius, E.
82-001410
Folmar, L. C.
82-001905
Foltz, J. W.
82-000544
Fontaine, M.
82-001559
Fontaine, T. D. III
82-002050
Forberg, K. G.
82-000605
Ford, E. D.
82-001171
Forster, R. P.
82-000729
Forstner, H.
82-000685
Fortin, R.
82-000862
82-000950
82-000991
Fortner, N. A.
82-001411
Foskett, J. K.
82-000668
Foskett, K. J.
82-001412
Foster, N. R.
82-001230
82-002490
Foster, S. A.
82-000900
Fostier, A.
82-000641
82-000669
82-001413
Fouche, L.
82-000016
Foucher, R. P.
82-002585
Fougner, S.
82-002027
Fountain, R. K.
82-000244
Fourmanoir, P.
82-001753
Fournie, J. W.
82-001055
Fournier, D.
82-002585
82-002972
82-002977
Fournier, H.
82-000991
Foutz, R. V.
82-002004
Fowler, L. G.
82-000521
Fox, P. J.
82-001102
Frakes, T.
82-002834
Fraley, N. B.
82-002263
Francis, M. P.
82-000050
82-000246
Frank, K. T.
82-000329

...CONTINUED...
Frank, K. T.
82-001592
82-002541
Franke, E. D.
82-001812
Frankel, J. S.
82-000101
82-002264
Franklin, F. L.
82-001927
Franssen, J.
82-001756
Fraser, A. H. G.
82-000269
Fraser, D. F.
82-001679
Fraser, G. A.
82-002796
Fraser, J. M.
82-001194
82-001351
82-002492
Frederick, L. L.
82-002423
Freeman, H. C.
82-001906
Freeman, L. A.
82-001122
Freeze, M.
82-000507
82-001181
82-002624
Freeze, T. M.
82-001389
French, R.
82-003010
Freshwater Biological Association
82-001950
Fricke, R.
82-001011
Friday, A. E.
82-001487
Fridberg, G.
82-001780
82-002499
Frie, R. V.
82-002586
Fritch, J. D.
82-000538
Fritts, T. H.
82-000310
Fritzsche, R. A.
82-000343
From, J.
82-001829
Fryer, J. L.
82-002716
82-002734
Fuchs, J.
82-000539

...CONTINUED...
Fuchs, J.
82-000545
Fugii, R.
82-000606
Fujita, S.
82-000696
Fuller, R. L.
82-000399
Funston, C. W.
82-001447
Furtado, J. I.
82-002575
Furuichi, M.
82-001414
82-002083
Gablehouse, D. W., Jr.
82-002994
Gabriel, W. L.
82-000911
Gabrielson, G.
82-001551
Gafford, G. M.
82-000014
Gagliardi, J.
82-000041
Gajdusek, J.
82-000289
Galassi, S.
82-000395
Gale, W. F.
82-000877
Galesso, R.
82-002743
Galicka, W.
82-002058
Gall, G. A. E.
82-002388
Galleguillos, R. A.
82-002380
Gallepp, G. W.
82-000697
Galloway, J. E.
82-001871
Gamburtseva, A. G.
82-002151
Gandolfi, G.
82-000395
82-000815
Garcia Pinto, L.
82-001529
Garcia, J. M.
82-002265
Garcia, M.
82-000131
82-000728
Gardner, G. A.
82-001344
Gardner, F. N.
82-001222

# AUTHOR INDEX

Garg, V. K.
82-000670
Garman, G. C.
82-001652
82-002542
Garofamo, J. S.
82-001907
Garrell, M. H.
82-001283
Garrett, G. P.
82-000608
82-000878
Garrick, J. A. F.
82-001757
Garside, E. T.
82-002853
Gartner, J. V., Jr.
82-002761
Garton, J. S.
82-000211
Garton, R. R.
82-001116
82-001561
82-001868
82-002835
Garzon F., J.
82-002668
Gas, N.
82-000714
Gascon, D.
82-000222
82-001560
Gaten, E.
82-001083
Gates, J. E.
82-002571
Gatesoupe, F.-J.
82-000546
82-000547
Gatlin, D. M. III
82-000548
Gaudet, J.-L.
82-001157
Gaudin, A. J.
82-002175
Gayevskaya, A. V.
82-002740
Gee, J. H.
82-001670
Geen, G. H.
82-001147
82-002595
Geevarghese, C.
82-002683
Geisler, N.
82-002276
Gelber, S. J.
82-002341
Genge, P. D.
82-002244
Genin, M.
82-000407
George, M. K.
82-002266
George, T. T.
82-001593
Georgi, T.
82-001415
Geraudie, J.
82-000424
82-000607
Gerking, S. D.
82-000233
82-001908
82-001947
Gerritsen, J.
82-001223
Gerstung, E. R.
82-001245
Gerth, W. A.
82-001416
Gery, J.
82-000360
Gesser, H.
82-002267
Getmantsev, V. A.
82-002413
Getter, C. D.
82-002625
Gharrett, A. J.
82-001198
Ghion, F.
82-000912
Ghittino, P.
82-000002
82-001830
Giattina, J. D.
82-001091
82-001561
82-001868
Giavenni, R.
82-001033
82-001779
Gibson, D. I.
82-000385
Gibson, D. M.
82-002268
Gibson, D. W.
82-002626
Gibson, J. M.
82-000544
Gibson, R. N.
82-000212
82-002398
Giebel, P. E.
82-002571
Gielen, J. T.
82-001417
82-002358

# AUTHOR INDEX

Giguere, L. A.
82-001223
Gilbert, C. R.
82-001002
Gilbert, R. J.
82-002465
Gilderhus, P. A.
82-002869
Giles, M. A.
82-001909
Gilhen, J.
82-002627
Gill, H. S.
82-000522
82-002269
Gillespie, J. H.
82-001113
Gilliland, E. R.
82-001653
Gilmore, R. G.
82-000257
82-000443
82-000892
82-003003
Gin, M.
82-002088
Giorgetti, G.
82-001044
Giorgi, A. E.
82-002106
Giovanardi, O.
82-000023
Girard, J.-P.
82-000094
Girsa, I. I.
82-000102
Gjosaeter, H.
82-002587
Gjosaeter, J.
82-000223
82-000305
Gladden, J.
82-002927
Gladson, J.
82-001284
Gleason, L. N.
82-001843
Glover, C. J. M.
82-002680
Gmyrya, I. F.
82-002369
Gnad, J. D.
82-002458
Gnyubkina, V. P.
82-002151
Godbout, R.
82-000330
Godcharles, M. F.
82-002619
Godkin, C. M.
82-002684
Goeden, G. B.
82-002028
Goeden, H. M.
82-001924
Goetz, F. W.
82-000738
82-001533
82-002270
Goetz, R. C.
82-001389
Goicoechea, O.
82-001490
Goldberg, S. R.
82-000247
Goldman, C. R.
82-000580
Goldspink, C. R.
82-000290
82-002787
Goldspink, G.
82-000709
82-002324
Goldstein, L.
82-000650
82-000729
Goldstein, R. M.
82-001108
Golimowski, J.
82-001095
Golovanov, V. K.
82-000700
Golub, L.
82-000819
Goncharov, B. F.
82-000103
Gonenc, T.
82-002966
Gonzales-Lanza, M. C.
82-001806
82-001807
Gonzalez, E.
82-002486
Goodfellow, W. L., Jr.
82-000967
Goodier, J. L.
82-001232
Goodman, E. D.
82-001871
Goodman, L. R.
82-001910
Goodwin, B.
82-000477
Goos, H. J. T.
82-000643
82-001417
82-002167
82-002227

## AUTHOR INDEX

Gophen, M.
  82-000908
Gorbach, E. I.
  82-002498
Gorbunova, N. N.
  82-002685
Gordin, H.
  82-001339
Gordon, D. J.
  82-002459
Gordon, D. M.
  82-001070
Gordon, M. S.
  82-000396
  82-000404
  82-000415
  82-000416
Gordon, R.
  82-001442
Gore, J. A.
  82-000453
Gorman, O. T.
  82-001747
Goshwami, S. V.
  82-001446
Goswami, A. K.
  82-002271
Goswami, S. V.
  82-002352
Goto, A.
  82-001598
  82-002408
Gould, R. W.
  82-001791
Goven, B. A.
  82-001849
  82-001890
  82-002099
Govindappa, S.
  82-000431
Govoni, J. J.
  82-002272
Grabner, M.
  82-000028
Grabowski, S. J.
  82-002964
Grabowski, S. M.
  82-002170
Gradall, K. S.
  82-001562
Graham, J. B.
  82-000671
Graham, T. E.
  82-001804
Granath, W. O., Jr.
  82-002767
Grande, L.
  82-002686
Grant, C. J.
  82-000286
Grant, J. J.
  82-002897
Grant, P. T.
  82-002104
Grant, W. S.
  82-000163
  82-000163
Graves, D. A.
  82-002143
Gray, C. B. J.
  82-000040
Gray, J. A. B.
  82-000175
  82-000593
Gray, P. L.
  82-000948
Gray, R. H.
  82-000672
  82-001900
  82-002139
Great Lakes Fishery Commission
  82-002886
  82-002887
Grecay, P. A.
  82-000304
Green, A. W.
  82-001989
Green, D. M.
  82-002460
Green, L. C.
  82-002066
Green, L. M.
  82-001709
Green, R. H.
  82-001453
Greenfield, D. W.
  82-001012
Greenfield, T. A.
  82-001012
Greenwood, C.
  82-002229
Greenwood, P. H.
  82-000609
Gress, F.
  82-000232
Greuel, E.
  82-001328
Griben, M. R.
  82-002029
Grier, H. J.
  82-000051
Griesbach, S.
  82-001869
Griffin, B. R.
  82-000365
Griffiths, W. B.
  82-001591
Grift, N. P.
  82-002806

Grillner, S.
82-001563
Grimaldi, M. C.
82-000721
Grimard, Y.
82-002999
Grimes, C. B.
82-001206
82-001547
Grimes, P. J.
82-000052
Grindley, J. R.
82-001711
82-001712
82-001713
Griswold, C. A.
82-000397
Grizzle, J. M.
82-000631
Groberg, W. J., Jr.
82-001059
Grodzinski, Z.
82-000613
Groninger, H. S., Jr.
82-001816
Gropp, J.
82-001320
Gross, M. R.
82-002493
Grosse, D. J.
82-000796
Grove, D. J.
82-001365
Grove, R. S.
82-002898
Grover, A.
82-002897
Gruber, D.
82-001469
Gruber, S. H.
82-000673
82-000805
82-000834
82-000924
82-002231
Guerra Padron, F.
82-000084
Guerrero, R. D. III
82-001295
Gueze, P.
82-001020
Guildal, J. A.
82-001850
Guillen, G. J.
82-000968
Guillory, V.
82-000859
82-000969
82-001207

...CONTINUED...

Guillory, V.
82-001210
82-002687
82-002896
82-002899
82-002900
Guldenaar, S. E. F.
82-002358
Gulland, J. A.
82-002030
82-002660
Gulliksen, B.
82-002168
Guma'a, S. A.
82-001366
Gundersen, R. E.
82-001367
Gunkel, G.
82-000306
Gunn, J. M.
82-000483
Gunther, K.-D.
82-001313
Guppy, M.
82-000046
Gupta, N. K.
82-002768
Gupta, O. P.
82-000674
82-002273
Gupta, S. D.
82-002152
Guser, A. G.
82-002413
82-002809
Gustavsson, I.
82-001095
Guthrie, C. A.
82-001871
Gutierrez, W.
82-002013
Guzman-Arroyo, M.
82-002588
Haag, M.
82-002375
Haas, M. A.
82-001186
Haas, R.
82-000835
Habib, G.
82-002641
Hacunda, J. S.
82-000304
82-000913
Hadley, W. F.
82-001071
Haedrich, R. L.
82-002344
82-002760

# AUTHOR INDEX

Haensly, W. E.
82-002146
82-002797
Hagen, D. W.
82-000045
82-001530
Hager, R. L.
82-002994
Haghighi, A. Z.
82-001118
Hagstrom, N. T.
82-001034
Hahnel, G. B.
82-001791
Haider, S.
82-001418
Hailman, J. P.
82-001564
Hails, A. J.
82-002494
Haines, T. A.
82-000398
82-001103
Hakkari, L.
82-000902
Haldorson, L.
82-001591
82-002723
Hale, M. M.
82-000581
Hales, D. C.
82-000845
82-001084
Halfon, E.
82-000994
Hall, L. C., Jr.
82-002798
Hall, M. C.
82-000764
Hall, N. E.
82-001891
Hall, T. R.
82-001419
82-001420
82-002274
Hallerman, E. M.
82-001255
Halliday, R. G.
82-003011
Halling, F.
82-000860
Hallock, R. J.
82-001202
Halpern-Sebold, L.
82-001494
Halter, F.
82-001887
Hamada, A.
82-003474
Hamada, K.
82-002408
Hamada, S.
82-001459
82-002310
Hamilton, S.
82-001103
Hamilton, S. J.
82-000053
82-000104
Hamilton, T. A.
82-001217
Hamman, R. L.
82-000017
82-000039
Hamme, R. E.
82-000377
Hammermeister, D. E.
82-002845
Hampl, A.
82-000056
Hampson, B. L.
82-001879
Hams, K. M.
82-002111
Hanke, W.
82-000674
82-000678
82-002273
Hankin, D. G.
82-001975
Hanna, P. J.
82-001119
Hannah, J. B.
82-001121
Hansell, D. A.
82-001214
Hansen, D. J.
82-001910
Hansen, F.
82-000011
Hansen, H. O.
82-000105
Hansen, S. R.
82-002835
Hanson, J. M.
82-000861
Hanson, L. H.
82-000459
Hanzel, D. A.
82-000937
Hara, A.
82-000743
Hara, S.
82-001337
Hara, T. J.
82-002393
Harada, K.
82-000914

...CONTINUED...
Harada, K.
  82-001045
  82-002543
  82-002730
Harbison, G. R.
  82-000271
Hardiman, P. A.
  82-001879
Hardin, T. S.
  82-002461
  82-002462
Hardman, W. H.
  82-002456
Hardy, G. S.
  82-000307
Hariri, K. I.
  82-003012
Haritos, A. A.
  82-002275
Harmin, S. A.
  82-002589
Harmon, F. R.
  82-000889
Harper, D. M.
  82-000584
Harrell, R. D.
  82-000374
  82-000399
Harrell, R. M.
  82-000949
Harrington, E. S.
  82-001956
Harrington, J.
  82-001388
Harrington, R. W., Jr.
  82-001956
Harris, F. A.
  82-000841
Harris, G. P.
  82-001343
Harris, J. M.
  82-002051
Harris, V. A.
  82-001107
Harrison, E. J.
  82-001071
Harrison, W. G.
  82-000588
Harshbarger, T. J.
  82-002939
Hart, M. H.
  82-000675
Hartfiel, W.
  82-001320
Hartman, G. F.
  82-001637
Harvey, B.
  82-000676
  82-002107
Harvey, B. R.
  82-002817
Harvey, G.
  82-000862
  82-000950
Harvey, H. H.
  82-000308
  82-000413
  82-002796
Harvey, W. D.
  82-001531
  82-001532
Haschemeyer, A. E. V.
  82-000677
Hasegawa, S.
  82-001431
Hashim, N. T.
  82-000951
Hashimoto, A.
  82-001421
Hashimoto, S.
  82-001315
  82-001316
  82-001331
Hassanen, G. D. I.
  82-001310
Hassemer, P. F.
  82-002901
Hassinger, R. L.
  82-000830
Hastings, P. A.
  82-000443
Hatakeyama, S.
  82-000419
  82-002836
Hauer, F. R.
  82-002985
Haug, T.
  82-002168
Haves, M.
  82-001911
Havey, K. A.
  82-002463
Hawkins, A. D.
  82-002800
Hay, D. E.
  82-001189
  82-002532
  82-003029
Hayama, K.
  82-000205
Hayase, S.
  82-000804
Hayashi, F.
  82-001045
  82-002730
Haynes, C. N.
  82-001710
Hazel, J. R.
  82-001499

# AUTHOR INDEX

Hazzard, L. K.
82-002930
Heald, D. I.
82-002628
Healey, M. C.
82-002661
Heard, H. W.
82-002061
Heath, M. E.
82-000652
Hecht, T.
82-002084
Heck, K. L., Jr.
82-002571
Heckmann, R. A.
82-001693
82-002720
Heemstra, P. C.
82-001758
Hegab, S. A.
82-000678
Heggberget, T. G.
82-002769
Heidinger, R. C.
82-002995
Heimbuch, D. G.
82-001243
Hein, S.
82-002770
82-002940
Heinrich, D.
82-000970
Heit, M.
82-001870
Heitmuller, P. T.
82-000425
Helfman, G. S.
82-000184
Helfrich, H.
82-000422
Helfrich, L. A.
82-001195
82-001197
82-001201
Helle, J. H.
82-000508
82-000517
Heller, J.
82-002399
Hem, S.
82-001300
Heming, T. A.
82-000679
Hemmingsen, E. A.
82-001416
Henderson-Arzapalo, A.
82-000527
Henderson, B.
82-000794
Henderson, E. B.
82-000889
Henderson, S.
82-000507
82-001181
82-002624
Hendricks, A. C.
82-002004
Hendricks, J. D.
82-001145
Hendricks, M. L.
82-001096
Hendrickson, D.
82-001196
Hendrickson, D. A.
82-001718
Hendrickson, G. L.
82-002719
Hendrix, G. A.
82-001871
Hendrix, M. A.
82-000031
Henley, D. T.
82-000893
Henry, S.
82-001704
Hentschel, H.
82-000097
Heppell, D.
82-001026
Hergenrader, G. L.
82-002987
Herman, R. L.
82-001072
Hernandez, D. R.
82-000480
Herrera, E.
82-001311
Herrick, C. J.
82-001871
Hess, T. B.
82-002465
Hesse, L.
82-001338
82-001584
Hesse, L. W.
82-002464
82-002986
82-002987
Hetherington, T. E.
82-001353
Hetrick, F. M.
82-001818
Heufelder, G. R.
82-002662
Hew, C. L.
82-000106
82-000667
82-002261

# AUTHOR INDEX

...CONTINUED...
Hew, C. L.
    82-002262
Heydorn, A. E. F.
    82-001711
    82-001712
    82-001713
Hibiya, T.
    82-000138
    82-001473
    82-001474
Hickey, C. R., Jr.
    82-000680
Hickey, G. M.
    82-000681
Hickley, P.
    82-003030
Hickman, T. J.
    82-001233
Hietanen, E.
    82-001916
Higgs, D. A.
    82-002085
Hightower, J. E.
    82-002465
Higler, L. W. G.
    82-000400
Higuera, M. de la
    82-002338
Hilborn, R.
    82-000461
Hildebrand, A. C.
    82-000359
Hilden, M.
    82-003013
Hilge, V.
    82-002215
Hilgert, P.
    82-002902
Hill, B. J.
    82-001827
    82-001831
Hill, L. G.
    82-000309
    82-001460
Hille, S.
    82-001422
Hillery, C. M.
    82-000666
Hilton, J.
    82-001957
Hilton, J. W.
    82-000423
    82-000682
    82-000683
    82-001912
    82-002086
    82-002277
Hindar, K.
    82-002424

...CONTINUED...
Hindar, K.
    82-002496
Hioki, S.
    82-000076
    82-000219
    82-002276
Hiramoto, T.
    82-002960
Hirano, T.
    82-001431
Hirasawa, Y.
    82-001326
Hirose, K.
    82-000153
Hirshfield, H. I.
    82-001907
Hixson, W. C.
    82-002515
Hjelmeland, K.
    82-001423
Hjort, R. C.
    82-002381
Ho, J. S.
    82-001851
Hoag, S. H.
    82-001993
    82-002000
    82-002035
Hoar, W. S.
    82-000684
Hobbs, H. H. III
    82-001348
Hochachka, P. W.
    82-000046
Hocutt, C. H.
    82-000401
    82-001096
    82-001865
    82-002799
Hodges, D. J.
    82-000392
Hodgins, H. O.
    82-001905
Hodson, P. V.
    82-000683
    82-002837
Hodson, R. E.
    82-001516
Hodson, R. G.
    82-000107
Hoese, D. F.
    82-000317
Hofer, R.
    82-000685
    82-001424
Hoff, F. H., Jr.
    82-002834
Hoff, M. H.
    82-002870

## AUTHOR INDEX

Hoffman, C. J.
82-001565
Hoffman, G. L.
82-001081
82-001814
Hoffman, S. G.
82-000198
Hoffman, W.
82-000310
Hoffmann, R.
82-001813
Hogarth, W. T.
82-002646
Hogendoorn, H.
82-000108
Hogler, S. R.
82-000952
Hogue, E. W.
82-001654
Hoines, L. J.
82-001185
Holcik, J.
82-002988
Holcombe, G. W.
82-001120
82-001930
Holden, A. V.
82-001097
Holeton, G. F.
82-001425
82-001894
Holland, L. E.
82-002858
Holliday, J. E.
82-000573
Holliday, M. C.
82-000458
Hollister, T. A.
82-000425
Holloway, H. L., Jr.
82-001034
Holmbom, B.
82-001928
Holmes, P. J.
82-000651
Holmes, S. B.
82-001142
Holmgren, S.
82-000686
82-001408
Holopainen, I. J.
82-001622
Holstein, B.
82-001426
Holt, J.
82-000054
82-000330
Holubetz, T.
82-001948
Honda, H.
82-000879
82-000880
Honda, K.
82-001208
82-002903
Hoole, D.
82-001073
Hooper, G. R.
82-001178
Hoornbeek, F. K.
82-001309
Hop Woo, L.
82-000476
Hope, S. J.
82-000540
Hopky, G. E.
82-002057
Horbert, W. R.
82-000758
Horikawa, M.
82-000283
Horlyck, V.
82-001829
Hornby, P. J.
82-000658
Horne, J. E. M.
82-001171
Horne, M. T.
82-001792
Horner, R.
82-001352
Horowitz, L.
82-000509
Horrall, R. M.
82-000863
82-001230
Hose, J. E.
82-001121
Hoshino, Y.
82-001336
Hoss, D. E.
82-000176
82-000610
Hotopp, W.
82-000109
Houde, E. D.
82-001714
Houlihan, D. F.
82-002255
Hourston, A. S.
82-000881
82-000915
82-001601
82-002031
82-002520
House, E. W.
82-001493
Houston, A. H.
82-000114

## AUTHOR INDEX

...CONTINUED...
Houston, A. H.
82-000687
82-001427
Howell, J.
82-000327
Howell, W. H.
82-002091
Howes, G.
82-000344
Howick, G. L.
82-000916
Howson, G.
82-002114
Hoyer, M. V.
82-001234
Hoyt, R. D.
82-001246
82-002521
Hu, L. C.
82-001680
Huang, F.
82-002236
Hubbard, G. M.
82-001412
Hubbs, C.
00-000000
Hubert, W. A.
82-001695
82-001987
Hudd, R.
82-002544
Hudson, P. L.
82-001257
Huebner, J. D.
82-000688
Hueckel, G. J.
82-002904
Hueter, R. E.
82-000805
Huey, D. W.
82-001122
82-001428
82-001913
Huffman, M. M.
82-002530
Huggett, R. J.
82-002802
Hughes, G. M.
82-000611
Hughes, G. W.
82-001720
Hughes, S. G.
82-000029
82-001342
82-002087
Huish, M. T.
82-000014
Hulata, G.
82-000528

...CONTINUED...
Hulata, G.
82-000725
Hultberg, H.
82-001994
Humphries, J. M., Jr.
82-000345
Hunn, J. B.
82-002279
Hunt, R. L.
82-001958
Hunt, S. M. V.
82-000689
82-002367
Hunt, T. P.
82-000426
Hunter, G. A.
82-000007
82-000008
82-000009
82-000570
82-001533
Hunter, J. R.
82-000217
Huntsman, G. R.
82-002602
Hussain, N. A.
82-002425
Hussien, S. A.
82-001035
Hutchinson, T. C.
82-001911
Huth, A.
82-000690
Hyatt, K. D.
82-000917
Hynes, J. D.
82-000508
Hyslop, E. J.
82-002545
Ibeun, M. O.
82-003038
Ibrahim, K. H.
82-002152
Ichihara, T.
82-002200
Idler, D. R.
82-002244
82-002325
Iga, T.
82-002280
Iguchi, M.
82-002368
Ihssen, P. E.
82-000767
82-000772
82-000837
Iida, K.
82-000498
Ikeda, K.
82-002343

## AUTHOR INDEX

Ikeda, S.
82-000205
82-000756
82-000757
82-001492
82-002097
Ikeda, Y.
82-000691
82-000692
82-002281
82-002282
Ikonen, E.
82-001240
82-002522
Iles, T. D.
82-000565
82-000864
82-000955
Ilyenkova, S. A.
82-000773
Imrie, D. M. G.
82-002546
Ina, K.
82-000549
Inada, Y.
82-000369
82-000372
Inamura, O.
82-000283
Ince, B. W.
82-000693
82-001321
Ingermann, R. L.
82-001429
82-002283
Ingham, R. E.
82-001852
Ingram, K. M.
82-001051
Inoue, M.
82-000185
82-001045
82-002088
82-002730
International Council for the Exploration of the Sea
82-000402
82-001098
82-001209
82-001267
82-001872
82-002032
82-002941
82-003014
International Pacific Halibut Commission
82-002888
International Pacific Salmon Fisheries Commission
82-002889
Irvine, J. R.
82-001655
Irwin, B.
82-000588
Ishak, M. M.
82-001310
82-002007
Ishida, Y.
82-002350
Ishihara, S.
82-000366
Ishii, K.
82-001546
82-002409
Ishikawa, T.
82-002838
Ishioka, H.
82-001430
Israelsen, E. K.
82-002516
Ita, E. O.
82-002064
Itada, N.
82-000751
Itazawa, Y.
82-001332
Ito, S.
82-000055
Itzkovich, J.
82-000725
Ivanova, M. N.
82-002495
Iwamatsu, T.
82-000135
Iwami, T.
82-000474
Iwanowicz, H. R.
82-001832
Iwaoka, W. T.
82-001121
Iwata, M.
82-001431
Iyeshko, Y. P.
82-002718
Izyumov, Y. T.
82-002156
Jackson, A. J.
82-000550
82-002077
82-002089
Jackson, M. B.
82-002117
Jacob, S. S.
82-000918
82-000919
Jacobs, K. E.
82-002948
Jagoe, C. J.
82-000003

## AUTHOR INDEX

Jain, M.
82-000418
Jakle, M. D.
82-000501
Jalabert, B.
82-001413
Jankowsky, H. D.
82-000109
Jansen, W. F.
82-001433
Janssen, J.
82-000271
82-001664
Jansz, G. F.
82-001894
Jasim, B. M.
82-000846
Jasper, S.
82-000040
Jauncey, K.
82-000551
Jayaprakash, A. A.
82-002634
Jayasri, M.
82-001814
Jeanjean, S.
82-001559
Jeges G., J.
82-002762
Jenes, C. K.
82-002744
Jenkins, N.
82-002253
82-002284
Jenkins, R. E.
82-002673
Jenkins, R. M.
82-001258
82-002473
Jenkinson, D. W.
82-001976
Jennings, M. R.
82-002688
82-002719
Jennison, B. L.
82-000443
Jensen, A. J.
82-000953
Jensen, A. L.
82-000224
82-000865
82-001217
82-001218
82-001873
82-001999
Jensen, L. A.
82-002720
Jensen, N. J.
82-002721
Jermolajev, E.
82-001351
Jeserich, G.
82-002154
Jester, D. B.
82-000866
Jilek, R.
82-001074
Jimenez, D.
82-001832
Jirasek, J.
82-000056
Jiwei, S.
82-001842
Jobling, M.
82-001317
82-001434
82-001700
82-001748
82-002590
Johal, M. S.
82-002629
Johannesson, B.
82-002285
Johansen, K.
82-000739
82-001394
82-001479
Johansen, P. H.
82-001117
Johansson, H.
82-000160
Johansson, N.
82-001780
John, P. A.
82-002683
Johnsen, B. O.
82-000953
82-002769
Johnson, A. G.
82-000054
Johnson, C.
82-002726
Johnson, D. L.
82-000567
82-002876
Johnson, E. Z.
82-002400
Johnson, J. E.
82-001158
82-002877
Johnson, J. H.
82-001661
82-002400
Johnson, K. A.
82-001793
82-001794
82-001796
82-002099

# AUTHOR INDEX

Johnson, K. L.
82-000406
Johnson, L.
82-002044
Johnson, M. S.
82-001027
Johnson, P. L.
82-002964
Johnson, R. H.
82-001822
Johnson, R. K.
82-002689
Johnson, V. G.
82-001135
Johnson, W. S.
82-002401
Johnston, C. E.
82-000110
Johnston, D. D.
82-002547
Johnston, I. A.
82-000130
82-000600
82-000634
Johnstone, A. D. F.
82-002800
Jones, A. R.
82-003000
Jones, B. W.
82-000782
Jones, D. R.
82-001435
82-001501
Jones, H. G.
82-002999
Jones, J. R.
82-000053
82-000104
82-001234
Jones, K. A.
82-001566
Jones, M.
82-002155
Jones, M. V.
82-000709
82-002324
Jones, P. L.
82-000694
Jones, P. W.
82-000933
Jones, R. C.
82-002155
Jones, R. I.
82-000841
Jones, R. T.
82-001436
Jonsson, A.-C.
82-001432
Jonsson, B.
82-002382

...CONTINUED...
Jonsson, B.
82-002424
82-002496
Jordan, R. M.
82-002478
Jordan, S. W.
82-002965
Jorgensen, P. E. V.
82-001060
Joshi, C. B.
82-002508
82-002630
Joshi, S. B.
82-000106
82-000667
Joswiak, G. R.
82-001534
Joysey, K. A.
82-001487
Juch, P. J. W.
82-002153
Jude, D. J.
82-002490
82-002662
82-002958
Judy, R. D., Jr.
82-000453
Julshamn, K.
82-001451
June, J. A.
82-001703
Juneau, C. L., Jr.
82-000455
Jurss, K.
82-000030
Justines, G.
82-000723
Kabata, Z.
82-000375
Kadota, H.
82-002350
Kagawa, H.
82-000111
82-000619
82-000708
82-001437
82-001521
82-002286
Kah, O.
82-001438
Kahan, D.
82-000509
Kain, D. G.
82-001681
Kainji Lake Research Institute
82-002890
Kaiser, K. L. E.
82-001874
Kaliyamurthy, M.
82-002065

Kaliymurthy, M.
82-002591
Kallman, K. D.
82-001384
Kalyani, M.
82-002287
Kamimura, T.
82-002294
Kanazawa, A.
82-001318
Kanno, Y.
82-000838
82-002466
Kanwisher, J. W.
82-001551
Kapetsky, J. M.
82-001262
Karakousis, J.
82-000170
Karaman, I. I.
82-000311
Karmali, K.
82-001442
Karp, W. A.
82-002029
Karpov, A. K.
82-000112
Karpovich, T. A.
82-002288
Karr, J. R.
82-000403
82-001747
Kas'yanov, A. N.
82-002156
Kasahara, N.
82-002529
Kashiwagi, E.
82-001539
Kashiwagi, S.
82-000371
Kasuga, S.
82-000419
Kasutyan, A. O.
82-002196
Katayama, T.
82-000037
82-000156
Kato, M.
82-001640
Kato, S.
82-001467
Katoh, J.
82-000510
Katz, Y.
82-002289
Kauffman, J.
82-000971
Kaufman, B.
82-000093
Kaushik, S. J.
82-001323
82-002290
Kautz, R. S.
82-001235
Kavaliers, M.
82-000806
82-001439
82-001567
82-001568
Kawai, K.
82-000369
82-000372
82-001046
Kawasaki, L. Y.
82-000396
82-000404
82-000415
82-000416
Kawasaki, T.
82-001742
Kazakov, R. V.
82-000773
Kazama, T. K.
82-000494
Kazantseva-Selezneva, A. A.
82-002690
Kearns, P. K.
82-001875
Keen, W. H.
82-000041
82-000920
Keenleyside, M. H. A.
82-002491
Kellems, R. O.
82-002090
Keller, C. R.
82-002989
Keller, W.
82-000483
Kelley, R. N.
82-002107
Kellogg, R. L.
82-001440
Kelly, P. R.
82-000232
Kelso, B. W.
82-000186
82-000187
Kemp, A.
82-000018
Kendall, A. W., Jr.
82-000894
Kendall, W. T.
82-001195
82-001197
82-001201
Kennedy, C. R.
82-001090

# AUTHOR INDEX

...CONTINUED...

Kennedy, C. R.
82-002771
Kennedy, G. J. A.
82-001569
Kent, B.
82-002291
Kent, C.
82-001345
Kent, M. L.
82-002722
Kentouri, M.
82-001319
82-001361
82-001570
82-002075
82-002548
Kepner, W. G.
82-000882
82-002631
82-002632
Kerby, J. H.
82-000014
Kerr, S.
82-000915
Kerr, S. R.
82-000779
82-001441
Kesbeke, F.
82-000155
82-001513
82-001514
Kettler, M. K.
82-002374
Keyes, R.
82-000807
Keyes, R. S.
82-000204
Khakimullin, A. A.
82-000462
Khan, R. A.
82-000367
82-001052
82-001914
82-002467
82-002467
82-002765
Khan, Z. U.
82-002855
Khangarot, B. S.
82-001123
Khodzher, L. C.
82-002292
Khramtsova, V. S.
82-002448
Khuda-Bukhsh, A. R.
82-000774
Kiceniuk, J. W.
82-001914
Kieselstein, M.
82-002215
Kiessling, A.
82-001476
Kikuchi, M.
82-001146
Kikuchi, Y.
82-000611
Kilambi, R. V.
82-002549
Kilarski, W.
82-000613
Kilham, P.
82-001216
Killcreas, W.
82-000016
Kim, Ye. D.
82-000157
Kime, D. E.
82-000695
82-002293
Kimmel, J. J.
82-002785
Kimmel, W. G.
82-001099
Kimura, D. K.
82-002973
Kimura, H.
82-002731
Kimura, M.
82-001406
Kimura, S.
82-000921
82-002294
Kimura, T.
82-000368
Kincaid, H.
82-002871
King, D. L.
82-002964
King, G. M.
82-001442
Kinghorn, B. P.
82-000511
82-000571
Kinsman, D. J. J.
82-001171
Kircheis, F. W.
82-000463
Kirillov, A. F.
82-002295
Kirka, A.
82-002633
82-002891
Kirsch, R.
82-001443
Kirschbaum, F.
82-000750
Kissil, G. W.
82-001329
Kitabatake, Y.
82-001224

## AUTHOR INDEX

Kitajima, C.
82-000696
Kitchell, J. F.
82-000282
Kito, H.
82-002838
Kjorsvik, E.
82-002168
Klaassen, H. E.
82-002994
Klauda, R. J.
82-000405
Klaverkamp, J. F.
82-001909
Klein-Macphee, G.
82-002091
Kleiner, C. F.
82-001192
Kleinholz, C. W.
82-001653
Kleinzeller, A.
82-001483
Klimov, V. I.
82-002402
Klinger, S. A.
82-000697
Klootwijk-Vandijk, E.
82-000734
Klusek, C. S.
82-001870
Klyashtorin, L. B.
82-002296
Klyashtorin, L. V.
82-000113
Klyukanov, V. A.
82-000341
Knap, A. H.
82-001140
Knauss, J. A.
82-003022
Knight, M. J.
82-001107
Knight, N. J.
82-002390
Knight, R. L.
82-000922
Knoeppel, S. J.
82-002297
Knox, D.
82-000552
Knudsen, J.
82-000105
Knuth, M. L.
82-001137
Kobayashi, A.
82-001421
Kobayashi, K.
82-000076
82-000914
Kocan, R. M.
82-000427
Kocher, T.
82-002699
Kochkin, P. N.
82-000291
Kock, J.
82-002157
82-002158
Kock, R. L.
82-000992
Kodama, M.
82-001915
82-002839
Kodric-Brown, A.
82-000883
Koeneman, T. M.
82-001993
Koerner, J. F.
82-000948
Koester, D. M.
82-001368
Kohler, C. C.
82-001259
82-002550
Kohler, N. E.
82-001668
Kohn, A.
82-001853
Koike, A.
82-002960
Kojima, H.
82-002737
82-002753
82-003031
Kokholyan, V. K.
82-002831
Konar, S. K.
82-002824
82-002840
Konchin, V. V.
82-002298
Konchina, Yu. V.
82-000272
Kondo, H.
82-000143
Kondo, T.
82-001492
82-002097
Konosu, S.
82-000128
Koonce, J. F.
82-000784
82-001168
Koops, H.
82-000529
82-001320
82-001330
Korhonen, I.
82-002326

# AUTHOR INDEX

Korlupayev, B. I.
  82-002286
Kormanik, G. A.
  82-002232
  82-002233
Kormann, J.
  82-002159
Kornfield, I.
  82-000164
  82-000477
  82-002699
Kornfield, I. L.
  82-000612
Kornilova, G. N.
  82-000273
Korniyenko, G. G.
  82-002220
Korsgaard, B.
  82-001444
Korson, C.
  82-002965
Kortmulder, K.
  82-001008
  82-002497
Koslow, J. A.
  82-001971
Koss, T. F.
  82-000114
  82-001427
Kostrov, B. P.
  82-002841
Kothbauer, H.
  82-000115
Kotlyar, A. N.
  82-002691
Kott, E.
  82-001773
Kottelat, M.
  82-002692
Koury, B.
  82-001816
Kovacs, T. G.
  82-002842
  82-002843
Kovaljova, A. A.
  82-002740
Kozel, T. R.
  82-000972
  82-001781
Kozlowska, H.
  82-000542
  82-002078
Kracht, R.
  82-000213
Krajnovic-Ozretic, M.
  82-000057
Kramar, O.
  82-001948
Kramer, B. M.
  82-002878
Kramer, D. L.
  82-000116
  82-000698
  82-001632
Kramer, J. M.
  82-001881
Krant, J.
  82-001339
Krasey, C. R.
  82-001973
Krasnicki, K.
  82-000542
Krasnoperova, S. V.
  82-001535
Krasny, E. J., Jr.
  82-002259
Kratz, K.
  82-000923
Kraul, S.
  82-000024
Krauskopf, M.
  82-001490
Kreuz, K. F.
  82-000954
Krickl, S. P.
  82-002270
Krieger, K. J.
  82-001977
Kriete, W. H., Jr.
  82-000809
Krishna Pillai, S.
  82-002634
Krishnamoorthi, B.
  82-002917
  82-003015
Krishnamurthy, K. N.
  82-002591
Kristoffersson, R.
  82-002332
Kroll, W.
  82-000248
Krous, S. R.
  82-002844
Kruchinin, O. N.
  82-002403
Krueger, C. C.
  82-000775
  82-001196
  82-002695
Kruger, A.
  82-001396
Krupp, F.
  82-001759
Kruse, G. H.
  82-000954
Kruse, K. C.
  82-000543
Kruskamp, W. H.
  82-002521

# AUTHOR INDEX

Krykhtin, M. L.
  82-002498
Krylova, V. D.
  82-000165
Krzywosz, T.
  82-001646
Kucera, P. A.
  82-000852
Kudo, G.
  82-001816
Kudo, S.
  82-002182
Kuehl, D. W.
  82-000406
Kuenzer, P.
  82-000808
Kuhlmann, H.
  82-000529
Kuhns, J. F.
  82-001782
Kulczycki, G. R.
  82-000443
Kulikova, N. I.
  82-001445
Kulka, D. W.
  82-000585
  82-000895
Kulkarni, G. M.
  82-002635
Kullander, S. O.
  82-001760
Kulshrestha, A. K.
  82-001075
Kumar, S.
  82-000434
Kumaraguru, A. K.
  82-001124
Kumari, V. J. V. R.
  82-002193
Kunhikoya, K. K.
  82-002577
Kunimine, I.
  82-001045
Kunjipalu, K. K.
  82-002918
Kunju, M. M.
  82-002923
Kunze, R.
  82-002056
Kuo, A. D.
  82-002379
Kuo, P. K.
  82-002379
Kurian, A.
  82-002551
Kuroki, K.
  82-002080
  82-002081
Kuroki, T.
  82-000813
Kurzawski, K. F.
  82-002985
Kusher, D.
  82-000947
Kusto, E.
  82-002058
Kusuda, R.
  82-000366
  82-000369
  82-000372
  82-001046
  82-002731
Kuthalingam, M. D. K.
  82-002919
Kutkuhn, J. H.
  82-001236
Kuttappan, A. C.
  82-002918
Kux, Z.
  82-000058
  82-001369
Kuz'mina, V. V.
  82-000117
Kuznetsov, A. A.
  82-000103
Kuznetsov, V. A.
  82-000331
Kuznetsov, Y. A.
  82-002403
Kwain, W.
  82-002426
Kychanov, V. M.
  82-002299
Kyle, R.
  82-001715
Laale, H. W.
  82-002161
Laarman, P. W.
  82-002942
  82-002949
LaBounty, J. F.
  82-000576
  82-001959
Lacey, S. M.
  82-001854
Lackner, R.
  82-000028
Lacy, E. J., Jr.
  82-000957
Lagasse, P.
  82-001965
Laitinen, M.
  82-001916
  82-002326
Lal Mohan, R. S.
  82-002160
Lalancette, L.-M.
  82-000470
Lall, S. B.
  82-001118

## AUTHOR INDEX

Lam, T. J.
82-000512
82-000513
Lamba, V. J.
82-001446
82-002352
Lambert, J. G. D.
82-000643
Lambert, T. C.
82-002100
Laming, P. R.
82-001447
Lammers, P. I.
82-002364
Lamsa, A.
82-000784
Landers, E. J.
82-002776
Landis, W. J.
82-000607
Landolt, M. L.
82-000427
82-001121
Landry, A. M.
82-000968
Landye, J. J.
82-000582
Lane, E. B.
82-001571
82-002162
Lane, H. C.
82-002163
Lang, I.
82-000059
Lange, R. H.
82-000613
Langeland, A.
82-002552
82-002963
Langille, R. M.
82-000759
Langton, R. W.
82-000688
Lanigan, S. H.
82-000312
Lanzing, W. J. R.
82-000699
Lapin, Yu. Ye.
82-000102
Lapkin, V. V.
82-000700
LaPlace, J. A.
82-000472
Lark, J. G. I.
82-000554
Larkin, J. R.
82-001357
Larkin, P. A.
82-000514
...CONTINUED...
Larkin, P. A.
82-000779
82-002610
Larking, P. A.
82-000776
Laroche, J. L.
82-002164
82-002592
82-002601
Larrick, S. R.
82-001091
Larsen, J. L.
82-001795
82-001797
82-002721
Lasenby, D. C.
82-002117
Lasker, R.
82-000217
82-000499
Last, F. T.
82-001171
Lasta, C. A.
82-000242
82-000243
Latse, Z. M.
82-002059
82-002372
Lau, S. R.
82-002165
Lauder, G. V.
82-000060
82-000609
82-001360
82-002166
Laudien, H.
82-000249
Lauf, P. K.
82-001448
Laurs, R. M.
82-000499
Lavenberg, R. J.
82-001000
Lavender, W. A.
82-001557
Lavrova, Ye. A.
82-000133
Law, F. C. P.
82-000428
Lawson, C. S.
82-001173
Layher, W. G.
82-000292
Layton, M.
82-000502
Lazarus, S.
82-002553
82-002693
82-002772

## AUTHOR INDEX

Le Bras, Y. M.
82-001449
Le Gal, Y.
82-002164
Le Martret, M.
82-002412
Le Martret, M.-A.
82-001572
Le Ruz, H.
82-002357
Leach, G. J.
82-002300
Leach, P. J.
82-001251
Leaman, B. M.
82-000654
Leaney, A. J.
82-000493
Lear, H.
82-000367
Leary, R.
82-000777
Leatherland, J. F.
82-000119
82-000701
82-001450
82-001917
82-002092
82-002301
82-002302
Lebo, J. R.
82-000967
LeBrasseur, R. J.
82-000474
Lebreton, J. D.
82-000473
Lederman, T. C.
82-001876
82-001877
Leduc, G.
82-002842
82-002843
Lee, D. P.
82-001247
Lee, R. M.
82-001908
Leeuw, A. M. de
82-002167
Legendre, M.
82-000669
Leggett, W. C.
82-000329
82-000861
82-001592
82-002541
Lehtonen, H.
82-003013
Leis, J. M.
82-000614
Leknes, I. L.
82-000061
Leme Dos Santos, H. S.
82-002305
Lemly, A. D.
82-001076
82-001682
Lemm, C. A.
82-000031
Lemons, D. E.
82-002243
Lenanton, R. C. J.
82-000286
Lenarz, W. H.
82-001638
Lenat, D. R.
82-001882
Leonard, E. N.
82-000406
Leong T. S.
82-000363
Leong, J. C.
82-001059
Leonzio, C.
82-002801
Leosch, J. G.
82-000809
Leray, C.
82-000120
Les, B. L.
82-002449
Lesel, R.
82-000118
Leslie, A. J., Jr.
82-000884
Lesniak, J. A.
82-001918
Lester, R. J. G.
82-002741
Lethbridge, R. C.
82-000062
Leunissen, J. L. M.
82-002167
LeValley, M. J.
82-001919
Levi, E. J.
82-000471
Levin, G. B.
82-000702
Levine, J. S.
82-000810
Levy, D. A.
82-000839
Lewis, D. H.
82-002732
Lewis, D. J.
82-001077
Lewis, D. S. C.
82-000840

## AUTHOR INDEX

...CONTINUED...
Lewis, D. S. C.
82-002694
82-002707
Lewis, G. E.
82-000225
82-000488
82-001100
Lewis, H. S.
82-002987
Lewis, R. E.
82-000070
Lewis, W. M.
82-000537
Li, H. W.
82-000464
Li, R. M.
82-001965
Li, S.
82-000019
82-000020
Liaw, W. K.
82-001101
Libey, G. S.
82-000789
82-000790
Libosvarsky, J.
82-000058
82-000063
82-000084
82-001369
Licata, A.
82-001522
Lidgerding, B. C.
82-000365
Lied, E.
82-001451
82-002303
Liem, K. F.
82-000060
82-001360
Lieska, N.
82-001487
Liley, N. R.
82-000811
82-001463
Lilygreen, V.
82-002950
Lima, A. R.
82-002845
Limsuwan, C.
82-001926
Limsuwan, T.
82-001322
Lin, H.-R.
82-000530
Lin, W. L.
82-000032
Lincoln, R. F.
82-000166
Linder, A. D.
82-002636
Lindquist, D. G.
82-001728
82-002411
82-002445
Lindsay, B. P.
82-000304
Lindsay, J. M.
82-001220
Lindsey, C. C.
82-000575
82-000615
Linfoot, B. T.
82-000541
Lingling, W.
82-001370
Link, G. W., Jr.
82-001726
Linko, R.
82-002804
Linsdau, G. M.
82-002093
Lipps, J. H.
82-000964
Lipton, D. W.
82-002047
Lison, S.
82-002215
Lisovenko, L. A.
82-000250
Liston, C. R.
82-002965
Litvinenko, N. I.
82-000064
Liu, J. K.
82-000032
Liu, X. Z.
82-000032
Livingston, J. M.
82-000426
Livingston, P.
82-002919
Loar, J. M.
82-001984
Lobel, P. S.
82-000346
82-002502
Lock, J. T.
82-001296
Locke, D. O.
82-002463
Lockhart, W. L.
82-002806
Lodenius, M.
82-000409
Loekle, D. M.
82-002404
Loeng, H.
82-000909

## AUTHOR INDEX

Loenn, B.-Z.
82-001452
Loesch, J. G.
82-002802
Loftus, D. H.
82-001618
Loftus, K. H.
82-001159
82-002879
Loginova, G. A.
82-001535
Lom, J.
82-001815
Lomholt, J. P.
82-000739
82-001394
Lone, K. P.
82-000531
82-001321
82-002304
82-002311
Longanecker, D.
82-002361
Longval, M. J.
82-000924
Lonning, S.
82-002168
Lopes, R. A.
82-000100
82-002305
Lopez S., M. I.
82-001013
Lord, D.
82-002771
Lorenzen, W. E.
82-001257
Lotrich, V. A.
82-001519
Lotspeich, F. B.
82-002880
Love, M. S.
82-000214
Lovegrove, S. M.
82-001921
Lovell, R. T.
82-001322
82-002729
Low, R. A.
82-000993
Low, R. A., Jr.
82-003016
Loyacano, H. A., Jr.
82-000949
Lubbock, H. R.
82-000965
Lubbock, R.
82-001021
Lucas, J. R.
82-001656
Lucchini, M.
82-002791
Ludke, J. L.
82-001103
Ludqvist, H.
82-002499
Luecke, C.
82-000274
Luempert, L. G. III
82-000167
Luey, J. E.
82-002468
82-002695
Luhning, C. W.
82-002868
Luk'yanenko, V. I.
82-000133
Lund, B.
82-002303
Lundberg, B.
82-000275
Lundqvist, H.
82-000160
Luquet, P.
82-000547
82-001323
82-002290
82-003027
Lusk, S.
82-000489
Luther, G.
82-003017
Luts, G. I.
82-000121
Lutz, P. L.
82-002231
Lux, F. E.
82-000896
Lykkeboe, G.
82-000744
Lynch, T. J.
82-002170
Lynde, C. M.
82-002029
Lyons, B. W.
82-001536
Lyons, J.
82-002846
Lyovin, A. V.
82-002523
Lythgoe, J. N.
82-002184
Mac, M. J.
82-000989
Maccioni, R. B.
82-000122
MacCrimmon, H. R.
82-000812
82-002459

# AUTHOR INDEX

...CONTINUED...
MacCrimmon, H. R.
82-002937
MacDonald, C. D.
82-001630
MacDonald, J. S.
82-000313
82-001453
Macdonald, R. D.
82-002749
MacDonald, R. E.
82-000573
MacDonald, S. M.
82-002557
Maceina, M. J.
82-000001
Macey, D. J.
82-001454
82-001455
82-002306
MacGregor, R. III
82-000123
Machado-Allison, A. J.
82-002696
Machen, T. E.
82-001412
Mackay, W. C.
82-001126
Mackenzie, C.
82-002700
MacKenzie, C. L., Jr.
82-002951
MacKenzie, D. S.
82-002307
MacKenzie, K.
82-000385
Mackie, A. M.
82-001329
82-002405
Mackiewicz, J. S.
82-001612
MacLean, J. A.
82-001160
82-001199
MacLennan, D. N.
82-001190
82-003032
MacNichol, E. F., Jr.
82-000810
MacPherson, K. A.
82-001726
Madison, D. M.
82-002404
Maeda, H.
82-000914
Maeda, T.
82-000255
Maemets, A.
82-001238
Magee, S. M.
82-002383
Magnan, P.
82-002427
Magnhagen, C.
82-002554
Magnin, E.
82-000314
Magnuson, J. J.
82-000697
82-002394
Mahadevan Pillai, P. K.
82-002920
Mahajan, C. L.
82-001456
Mahnken, C. V. W.
82-001385
Maier, B.
82-001828
Main, J.
82-001988
82-002952
Mainoya, J. R.
82-001457
82-001458
Maiolie, M.
82-001954
Maiolie, M. A.
82-002115
Mais, K. F.
82-000226
Maitipe, P.
82-001008
Maitland, P. S.
82-000784
82-000973
82-001161
Majkowski, J.
82-000124
Majnarich, J. J.
82-001800
Makeyeva, A. P.
82-000065
Makino, Y.
82-000283
Malhotra, J. C.
82-000022
Malins, D. C.
82-001922
Malkov, A.
82-002582
Mallatt, J.
82-002555
Mallery, C.
82-002259
Mallicoate, D. L.
82-000294
Malmqvist, B.
82-000925
Maloiy, G. M. O.
82-000046

## AUTHOR INDEX

Malueg, K. W.
82-000414
Malyukina, G. A.
82-002406
Mandal, P. K.
82-001075
Mangel, M.
82-001833
Mangunwiryo, H.
82-001822
Mann, R. H. K.
82-000926
Manning, C. S.
82-001910
Manning, M. J.
82-001498
82-002201
Manning, N. J.
82-002293
Manooch, C. S. III
82-000456
82-001685
82-002428
Manthey, M.
82-001330
Marais, J. F. K.
82-003004
Marcuzzi, O.
82-001413
Marenchin, G. L.
82-000974
Margiocco, C.
82-000421
82-002849
Margolis-Kazan, H.
82-001494
82-002341
Margolis, L.
82-001777
82-002756
Margraf, F. J.
82-000922
Mari, A.
82-000293
82-002663
Marian, M. P.
82-000553
Marino, R. P.
82-001014
Markert, J. R.
82-002085
Marking, L. L.
82-002827
Markiw, M. E.
82-001820
Markle, D. F.
82-000905
82-002429
Marks, J. E.
82-002732
Marliave, J. B.
82-000025
82-000033
Marlot, S.
82-000669
Marosz, E.
82-000526
Marrin, D. L.
82-002556
Marriott, R. A.
82-000948
Marsal, J.
82-000149
Marsh, A. C.
82-000260
Marshall, B. E.
82-001743
Marshall, J.
82-000277
Marshall, K. E.
82-000502
Marshall, S. L.
82-001371
82-001619
Marshall, W. S.
82-000125
82-000126
Martem'yanov, V. I.
82-002406
Martin-Robichaud, D. J.
82-002563
Martin, F. D.
82-000227
82-000933
Martin, H. C.
82-001878
Martin, J.
82-000554
Martin, L.
82-000947
Martin, N. V.
82-001199
Martin, R. B.
82-002370
Martinez, G. J.
82-001594
Martini, F. H.
82-001573
Maruyama, T.
82-000251
Masada, M.
82-001468
Masai, H.
82-002169
Mascarello, F.
82-001393
Maslova, M. N.
82-002308
Mason, C. F.
82-002557

# AUTHOR INDEX

Maas, H. J.
82-002228
Masui, M.
82-002247
Masurekar, V. B.
82-002309
82-002829
Matallanas, J.
82-000927
Matheson, A. T.
82-001897
82-001923
Matheson, R. E., Jr.
82-000315
Mathews, R. W.
82-000677
Mathews, S. B.
82-000993
Mathias, J. A.
82-000465
82-000554
Mathis, P.
82-001524
Mathisen, O. A.
82-000228
Mathur, D.
82-001349
Matlock, G. C.
82-001989
Matsubara, J. A.
82-000188
Matsuda, T.
82-000371
Matsui, T.
82-001459
82-002310
Matsumiya, M.
82-000129
82-000703
Matsumiya, Y.
82-001631
Matsumoto, J.
82-002170
Matsumoto, W. M.
82-000494
Matsushita, K.
82-000872
82-001639
Matsuzaki, K.
82-000283
Mattheeuws, A.
82-000407
Matthews, W. J.
00-000000
82-000309
82-000976
82-001460
82-001716
Matthews, W. M.
82-000975
Matthiessen, P.
82-001102
82-001125
Mattisson, A.
82-001372
Matty, A. J.
82-000531
82-000550
82-001321
82-002304
82-002311
Matuda, K.
82-001208
Mauchline, J.
82-002558
Mauck, W. L.
82-002827
Maughan, O. E.
82-002014
Maximenkov, V. V.
82-002664
Maxwell, J. G. H.
82-000316
82-001078
Mayama, H.
82-001640
Mayberry, R. D.
82-001683
Mayden, R. L.
82-000832
82-002433
Mayer, F. L.
82-000053
82-000104
82-001103
Mayes, M. A.
82-000386
Mazeaud, F.
82-000189
Mazmanidi, N. D.
82-002847
McAfee, M. E.
82-001978
82-002933
McAllister, D. E.
82-002627
82-002684
McAndrew, B. J.
82-001373
McArthur, C. P.
82-001053
82-001079
McBride, F. T.
82-000841
McBride, J. R.
82-000429
82-002085
McCarter, J. A.
82-001897

# AUTHOR INDEX

...CONTINUED...
McCarter, J. A.
82-001923
McCarthy, D. H.
82-001796
82-002099
McCaughran, D. A.
82-001993
McCauley, R. W.
82-001461
McClellan, D. B.
82-001269
McClure, M.
82-000698
McComas, S. R.
82-000908
82-001657
McCormick, C. A.
82-000616
McCosker, J. E.
82-001761
82-001766
82-002697
McCray, E. M., Jr.
82-001150
McCrone, L. E.
82-000276
McCulloch, C. E.
82-002012
McCune, A. R.
82-000066
McDaniel, R.
82-000975
McDerment, S.
82-001792
McDonald, D. G.
82-000754
82-001462
McDonald, J.
82-001248
McDonald, J. F.
82-002379
McDonald, L.
82-002093
McDonald, L. L.
82-001745
McDonald, M. E.
82-000867
McDonald, T. E.
82-001777
McDonough, T. A.
82-001730
McEachran, J. D.
82-000355
82-001374
82-002698
McElderry, H.
82-001591
McFadden, C. A.
82-001130
McGeachin, R. B.
82-001215
McGlade, J. M.
82-000772
82-001537
McGregor, A. J.
82-001619
McGurk, J.
82-002444
McHugh, J. L.
82-001182
82-002047
McIntyre, J. D.
82-001202
McKaye, E. R.
82-002699
McKaye, K. R.
82-000190
82-002700
McKee, P. M.
82-001595
McKenna, M. G.
82-001717
McKeown, B. A.
82-001147
82-002863
McKim, J. M.
82-001924
82-002042
McKinnon, A. D.
82-002773
McLean, R. B.
82-002216
82-002316
82-002530
McMahon, B. R.
82-000754
McMillan, C. B.
82-001762
McMillan, C. W.
82-002665
McNulty, J. A.
82-000704
McVicar, A. H.
82-001080
82-001810
82-001821
McWilliams, P. G.
82-000705
82-002848
Mead, J. I.
82-002637
Meade, B.
82-002950
Meade, T. L.
82-002844
Meadows, R. E.
82-002617
Mearow, K. M.
82-000687

## AUTHOR INDEX

Medel-Ulmer, L.
  82-000842
Medgyesy, N.
  82-001324
Medved, R. J.
  82-000277
  82-002934
Meffe, G. K.
  82-000987
  82-001162
  82-001718
Meguro, T.
  82-002409
Mehegan, J. P.
  82-000116
Mehrle, P. M.
  82-000053
  82-000104
  82-001103
Meier, W.
  82-001834
Mein, C. G.
  82-001398
Meinke, D. K.
  82-002171
Meister, A. L.
  82-002478
Meister, M. F.
  82-001443
Mel'nikov, V. N.
  82-002312
Mel'nikov, Y. S.
  82-002593
Melack, J. M.
  82-001216
Mellado, W.
  82-000122
Mellergaard, S.
  82-001795
  82-001797
Melodia, F.
  82-000421
Mendelssohn, R.
  82-002974
Mensi, P.
  82-000421
  82-002849
Mergo, J. C., Jr.
  82-002774
Meriwether, F. H. II
  82-000532
  82-000572
Merrick, J. R.
  82-000885
  82-002066
Merrill, C.
  82-001885
Merriner, J. V.
  82-002272
...CONTINUED...
Merriner, J. V.
  82-002416
Meske, C.
  82-001313
Messamer, R. K.
  82-002093
Messing, J. M.
  82-002243
Meszaros, J.
  82-002633
Metallov, G. F.
  82-000133
Metcalf, M. T.
  82-000567
Metcalfe, J. D.
  82-002313
Methot, R. D., Jr.
  82-000868
Methven, D. A.
  82-002429
Metner, D. A.
  82-002806
Meunier, F. J.
  82-000067
  82-000617
  82-000626
  82-000633
  82-002172
Meyer-Rochow, V. B.
  82-002173
Meyer, F. P.
  82-002922
Meyer, J. H.
  82-001463
  82-001574
Meyer, M. K.
  82-000347
Micha, J.-C.
  82-000407
Michel, C.
  82-000370
  82-002733
Michibata, H.
  82-000127
  82-000430
Middaugh, D. P.
  82-000252
  82-000253
  82-001628
Midgley, S. H.
  82-000885
Midttun, L.
  82-000977
Miglarese, J. V.
  82-002665
Mih, W. C.
  82-000485
Mihursky, J. A.
  82-000933

# AUTHOR INDEX

Mikami, T.
82-001219
Mikel, H. C.
82-001972
Mikhailin, S. V.
82-002703
Miki, I.
82-000476
Miki, W.
82-000128
Mikodina, Y. V.
82-002442
Mikulin, A. Y.
82-002174
82-002314
Miley, W. W. II
82-000884
Milhous, R. T.
82-001965
Millares, N.
82-002486
Miller, B. S.
82-001121
Miller, C.
82-001207
82-001210
Miller, C. A.
82-001099
Miller, D. S.
82-001485
Miller, D. W.
82-000500
Miller, J. S.
82-000496
Miller, L. E.
82-000374
Miller, N. W.
82-001036
82-001037
Miller, P. J.
82-000348
82-002701
Miller, R. A.
82-000222
82-001560
Miller, R. L.
82-001175
Miller, R. R.
82-001002
82-002674
82-002675
Miller, S. J.
82-001684
Miller, T. G.
82-001126
Miller, W. R. III
82-001464
Milles, D. H.
82-001035
Milligan, C. L.
82-002315
Millikin, M. R.
82-001325
Mills, C. A.
82-001744
Mills, E. L.
82-000583
82-002979
Mills, K. H.
82-001973
Milner, N. J.
82-002803
Miltner, M.
82-000504
Minami, T.
82-001596
82-002407
Minckley, W. L.
82-000327
82-001176
82-001249
82-002566
Minton, J. W.
82-002316
Mirza, M. R.
82-000349
Mishra, A. P.
82-000733
82-001379
82-002194
Misra, M.
82-001477
Misra, R. K.
82-001356
82-002467
82-002467
Mitani, I.
82-001855
Mitani, T.
82-001631
Mitchell, A. I.
82-002405
Mitchell, A. J.
82-001081
82-001783
Mitchell, D. F.
82-000886
Mitchell, K. A.
82-000783
Mitchell, L. G.
82-001051
Mitson, R. B.
82-001974
Mitsuhashi, S.
82-001045
82-002730
Miura, T.
82-001211

## AUTHOR INDEX

...CONTINUED...
Miura, T.
82-002953
82-002954
Miyamoto, Y.
82-000706
Miyashita, A.
82-000185
82-002088
Miyashita, Y.
82-000606
Miyazaki, C.
82-000203
Mizuno, N.
82-002408
Moav, R.
82-000523
82-000528
Mochizuki, A.
82-000129
Modde, T.
82-002997
Modlin, R. F.
82-002051
Mohamed, O. M. M. J.
82-002250
Mohsin, A. K. M.
82-002638
Moilanen, R.
82-002804
Mojumder, P.
82-002500
82-002559
82-002581
82-002594
Mokady, S.
82-000036
82-000560
Mokhtar, A. S. bin
82-000363
Moksness, E.
82-002666
Molinski, M.
82-002058
82-002596
Moller, P.
82-000191
Molnar, K.
82-001082
Momzikoff, A.
82-001559
Monaco, P. J.
82-002384
Monroe, R. J.
82-000107
Montgomery, J. C.
82-001170
Montgomery, W. L.
82-000012
Montoya, R. V.
82-002317
Moodie, G. E. E.
82-000887
82-001530
Moody, J.
82-001083
Moon, P. A.
82-000209
82-002656
Moon, T. C.
82-001099
Moon, T. W.
82-000130
Moore, A. R.
82-001057
82-002749
Moore, D. E.
82-001200
Moore, R.
82-002501
82-002524
82-002600
Moore, R. L.
82-001880
Moore, W. S.
82-001534
Moores, J. A.
82-001658
Moorhouse, P.
82-001171
Morales, J.
82-000362
Morata, P.
82-000131
82-002318
82-002319
82-002320
Moreau, G.
82-000254
82-002805
Morgan, D. A.
82-000364
Morgan, R. P. II
82-001465
Morin, R.
82-002430
Moring, J. R.
82-000003
82-001960
82-002943
Moriwaki, S.
82-000199
82-000200
Morizot, D. C.
82-002321
Mork, O. I.
82-000518
Morris, A. C.
82-002797
Morris, J.
82-000093

# AUTHOR INDEX

Morris, M. A.
82-000618
Morris, R. G.
82-000225
Morris, S.
82-000493
Morris, S. L.
82-001375
82-002175
Morris, S. M.
82-000132
Morrison, C. M.
82-002775
Morrison, J.
82-001086
Morrison, J. D.
82-000638
Morrow, I. H.
82-001740
Mortensen, E.
82-002469
Morton, W. M.
82-000928
Mos, W.
82-002176
Moser, H. G.
82-000068
82-000217
Moser, M.
82-002720
82-002723
Moser, M. E.
82-001647
Mosier, D. T.
82-002682
Motzkin, F.
82-001339
Moyer, J. T.
82-001538
Moyle, P. B.
82-000464
82-001163
82-001166
82-001590
82-002390
82-002535
82-002639
Moyles, M. R.
82-002143
Mozley, S. C.
82-000867
Mpoame, M.
82-001784
82-002776
Msiska, O. V.
82-000533
Mugiya, Y.
82-000299
Muir, D. C. G.
82-002806
Muir, W. D.
82-001650
Mukai, M.
82-002408
Mukhacheva, V. A.
82-000350
Mukherjee, D.
82-000707
Mukherji, A. P.
82-001925
Mukhopadhyay, P. K.
82-001925
Mulcahy, D.
82-002744
Mulford, C. J.
82-002043
Mulian, R.
82-001719
Muller, M.
82-001225
Muller, R. G.
82-002008
Mulligan, T. J.
82-000848
82-001188
Mumaw, L.
82-002102
Mummert, J. R.
82-000907
Muniyandi, K.
82-002422
82-003019
Munn, C. B.
82-001798
Munro, A. L. S.
82-001790
82-001810
Munroe, B.
82-000583
Munroe, T. A.
82-000387
Munshi, J. S. D.
82-000136
Murabayashi, K.
82-001271
Murachi, S.
82-000199
82-000200
Murai, T.
82-000555
82-000813
82-001326
82-002094
Muramoto, S.
82-001127
82-001128
82-002850
Murawski, S. A.
82-002518

## AUTHOR INDEX

Murdy, E. O.
82-000317
82-001677
Muroga, K.
82-001799
Murphy, B. R.
82-002017
Murray, K. R.
82-000541
Murray, M.
82-002322
Murthy, T. L.
82-002860
Murthy, V. K.
82-000431
Murty, A. S.
82-000441
82-001926
Murty, V. S.
82-002640
Musial, C. J.
82-002818
Musick, J. A.
82-000623
Muszynski, G.
82-001403
Muth, R. T.
82-001710
Muzzall, P. M.
82-001785
82-001786
82-002777
Mwenesi, R.
82-001502
Myer, D. G.
82-002751
Myose, H.
82-002903
Naftel, G.
82-000202
Nagahama, Y.
82-000111
82-000154
82-000619
82-000708
82-001437
82-001521
82-002286
82-002323
Nagai, A.
82-000080
Nagasawa, K.
82-000388
Nagel, J. W.
82-001599
Nagel, R. L.
82-001388
Nagelkerken, W. P.
82-000978
Nagtegaal, D.
82-000321
Nagtegaal, D. A.
82-000318
Nagy, S.
82-002633
Nahhas, F. M.
82-001840
Nahhas, R.
82-000709
82-002324
Naiman, R. J.
82-000012
Nair, K. V. S.
82-002560
Nair, N. B.
82-000918
82-000919
Nakai, T.
82-001799
Nakamura, H.
82-002953
82-002954
Nakamura, I.
82-002177
Nakamura, M.
82-000710
82-000711
Nakamura, Y.
82-000419
82-001466
82-002368
Nakari, T.
82-001132
82-001502
Nakatani, T.
82-000255
Nakatsuru, K.
82-001632
Nakken, O.
82-000977
Nakonechnaya, M. G.
82-002745
Nalbant, T. T.
82-000349
Nall, L. E.
82-000884
Nammalwar, P.
82-002778
Naplin, N. A.
82-000894
Narahara, A. M.
82-001698
Narain, A. S.
82-001109
82-001138
Narasimham, K. A.
82-003018
Narayanan, K. R.
82-003009

# AUTHOR INDEX

Narayanan, M.
82-000553
Narita, R.
82-002035
Nash, R. D. M.
82-002431
Nashimoto, K.
82-002409
Natarajan, P.
82-002422
82-003019
Natarajan, R.
82-002439
Nath, P.
82-000740
National Academy of Sciences
82-000034
Natochin, Yu. V.
82-000133
Naughton, S. P.
82-000278
Nava, M. E.
82-001129
Neave, D. A.
82-003033
Neff, J. M.
82-001144
82-001934
82-002797
Negishi, K.
82-001467
Negishi, S.
82-001468
Nehring, R. B.
82-002925
Neil, S. J.
82-002410
Neill, W. H.
82-000649
82-001532
Neilson, J. D.
82-002578
82-002595
Neitzel, D. A.
82-001094
82-002659
Nellbring, S.
82-002476
Nelson, D. O.
82-000192
Nelson, J. A.
82-001104
Nelson, J. S.
82-001763
Nelson, R. S.
82-001685
Nelson, R., Jr.
82-003010
Nelva, A.
82-000319
Nepszy, S. J.
82-000768
Nero, R. W.
82-000586
Nesler, T. P.
82-001350
82-001961
82-002996
Nesterov, A. A.
82-002561
Nesterov, V. D.
82-001015
Neudecker, S.
82-002502
Neumann, D. A.
82-001105
Neves, R. J.
82-000261
Newcomb, B. A.
82-002464
82-002986
Newman, M. W.
82-001052
Newman, S. G.
82-001800
Newsome, C. S.
82-002178
Ney, J. J.
82-000466
82-001259
82-002432
82-002550
Ng, T. B.
82-002325
Nibaruta, G.
82-001756
Nichols, H. A.
82-002163
Nicholson, N.
82-002179
Nichy, F. E.
82-000896
Nickol, B. B.
82-002782
Nickum, J. G.
82-000029
82-000047
Nicol, J. A. C.
82-000055
82-000389
Nicolas, G.
82-000632
Nielsen, J.
82-000966
Nielsen, J. G.
82-002676
Nielsen, L. A.
82-001201
82-001652

# AUTHOR INDEX

...CONTINUED...
Nielsen, L. A.
82-002067
82-003028
Nieman, D. A.
82-000897
Niemi, M.
82-001106
Nieminen, M.
82-001916
82-002326
Nieuwenhuys, R.
82-001360
Nigrelli, R. F.
82-001064
82-001809
Nigro, A. A.
82-002432
82-002914
Niimi, A. J.
82-000408
82-001130
Nikinmaa, M.
82-000712
82-000713
82-001512
Nikol'skiy, V. N.
82-000236
Niles, S.
82-001327
Nilsson, N.
82-000193
Nilsson, N. A.
82-001161
Nishi, K.
82-000134
Nishimoto, M.
82-002861
Nishimura, M.
82-000203
Nishiyama, S.
82-002953
82-002954
Niwa, M.
82-001942
Noaillac-Depeyre, J.
82-000714
Noakes, D. L. G.
82-000161
Noble, R. L.
82-000467
82-000649
82-001254
82-001531
82-001532
82-001983
Noda, K.
82-000283
Nomura, T.
82-001801
Noor, M. H. M.
82-002062
Nordlie, F. G.
82-000715
Nordlie, W. C.
82-000715
Norman, M. D.
82-003028
Norris, R. M., Jr.
82-001250
Northcote, T. G.
82-000186
82-000187
82-000193
82-000839
82-001655
Northcutt, R. G.
82-001355
Norton, M. G.
82-001879
82-001927
Nose, T.
82-000555
82-001326
82-002094
Nose, Y.
82-000241
82-000872
82-001639
Novikov, G. G.
82-000112
Nugent, R. S.
82-003006
Nunn, G.
82-001469
Nunny, R. S.
82-001879
Nuorteva, P.
82-000409
Nuorteva, S.-L.
82-000409
Nuti, R. N.
82-000119
Nye, G. D.
82-001185
Nyman, H.-G.
82-000432
Nystrom, R. R.
82-001131
O'Brien, W. J.
82-000274
82-000907
82-001666
82-002573
O'Connell, C. P.
82-000716
O'Connor, D. V.
82-002490
O'Connor, J. M.
82-001105

## AUTHOR INDEX

O'Grady, K. T.
82-000410
O'Grady, S. M.
82-000717
82-001470
O'Leary, P. J.
82-002734
O'Neil, P. E.
82-000215
Obika, M.
82-001468
Odense, P.
82-002775
Oduleye, S. O.
82-001686
Ofstad, E. B.
82-000433
Ogasawara, T.
82-002368
Ogasawara, Y.
82-001336
Ogata, H.
82-000555
82-001326
Ogata, T.
82-001915
82-002839
Ogawa, M.
82-001471
Ogawa, T.
82-000200
Ogilvie, D. M.
82-001575
Ogilvy, C. S.
82-000718
82-001576
Oglesby, R. T.
82-001237
82-002012
Ogren, L.
82-002568
Oguri, M.
82-000069
82-002180
82-002327
Ogurtsov, G. I.
82-002402
Ohoka, T.
82-001468
Ohsuga, H.
82-000549
Ohta, H.
82-001376
82-002181
82-002199
Ohta, T.
82-000135
Ohta, Y.
82-000203
Oijen, M. J. P. van
82-002562
Oikari, A.
82-001452
82-001928
82-002231
Oikari, A. O. J.
82-001132
Ojha, J.
82-000136
Ojima, Y.
82-001539
Okada, H.
82-002182
Okamoto, M.
82-000813
82-002095
Okita, J.
82-000419
Okuda, H.
82-000741
Olafson, R. W.
32-001923
Olcese, J. M.
82-001420
Oldham, R. S.
82-000938
Olito, C.
82-001525
Oliver, J. D.
82-001472
Olivereau, J. M.
82-000137
Olivereau, M.
82-000137
Olmsted, L. L.
82-000070
82-000211
Olsen, D. A.
82-000472
Olsen, H. F.
82-000320
Olson, K. R.
82-002291
Olson, R. E.
82-000376
Omeljaniuk, R. J.
82-001401
Omura, Y.
82-002327
Ono, R. D.
82-002183
Ono, S.
82-000080
Ooga, S.
82-000185
Oordt, P. G. W. J. van
82-000643
Orth, D. J.
82-002014

Osadchaya, Y. F.
82-002745
Osborn, M. F.
82-001951
Osborne, L. L.
82-001880
Ose, Y.
82-002838
Oshiro, T.
82-000138
82-001473
82-001474
Osse, J. W. M.
82-001225
Ostergaard, D. E.
82-002935
Ostermann, W.
82-000322
Oswood, M. E.
82-002990
Ota, T.
82-002328
Otake, S.
82-000703
Otero, H.
82-000495
Otero, H. O.
82-000480
82-002470
82-003020
Ottaway, E. M.
82-000256
Otten, E.
82-000620
Ottolenghi, C.
82-001475
Otwell, W. S.
82-000139
Overstreet, R. M.
82-001055
82-001139
82-002764
82-002779
Ozaki, H.
82-000691
82-000692
Pacchetti, G.
82-000395
Pacific Fishery Management Council
82-001268
Pacific Marine Fisheries Commission
82-001952
Packer, R. K.
82-002297
Page, J. W.
82-002096
Page, L. M.
82-002420
82-002433
...CONTINUED...
Page, L. M.
82-002434
Page, T. L.
82-000672
Pai, S. R.
82-002309
Paim, U.
82-002474
Paine, M. D.
82-002435
Palko, B. J.
82-000216
82-001597
Palmork, K. H.
82-001140
Paloheimo, J. E.
82-001745
Paloma, P. A.
82-000716
Pande, J.
82-002793
Pandey, B. N.
82-002597
Pandey, K.
82-000814
82-001477
82-001929
Pang, P. K. T.
82-000636
Pankhurst, N. W.
82-002184
82-002329
82-002330
Pant, S. C.
82-000434
Papaconstantinou, C.
82-001687
Paperna, I.
82-002746
Papst, M.
82-000465
82-000554
Papst, M. H.
82-001688
82-002057
Paragamian, V. L.
82-002928
Parenti, L. R.
82-002702
Parin, N. V.
82-001377
82-001764
82-002703
Paris, J.
82-001319
82-001361
Parker, B. J.
82-001595
Parker, J. H.
82-002913

Parker, N. C.
82-001340
Parker, S. S.
82-001371
Parmanne, R.
82-000856
82-000869
82-000870
82-000871
82-002471
82-002475
82-002808
Parmer, M.
82-002243
Parmley, D.
82-001286
Parrish, P. R.
82-000425
Parrish, R. H.
82-000294
Parrotta, J. A.
82-002216
Parsons, J. E.
82-000558
Part, P.
82-000621
82-001476
Partridge, B. L.
82-000194
Pasaribu, B. P.
82-003034
Pascal, M.
82-000067
Pascho, R.
82-002744
Pascoe, D.
82-002866
Pasdar, M.
82-001255
Pashchenko, N. I.
82-002196
Passino, D. R. M.
82-001881
Passow, B.
82-002396
Patalas, K.
82-000575
Patashnik, M.
82-001816
Patch, J. R.
82-001518
Paterson, W. B.
82 001817
Pati, S.
82-001990
82-002503
Patra, A. K.
82-000136
Pattee, E.
82-000295

...CONTINUED...
Pattee, E.
82-000319
82-000473
Patterson, C.
82-001360
Patzner, R. A.
82-002504
Paulin, C. D.
82-002641
Pauly, D.
82-003008
Pavlov, D. S.
82-001577
Pavlychev, V. P.
82-002526
Pawaputanon, K.
82-000390
Pawaputanon, O.
82-000936
Pawson, M. G.
82-001425
Paxton, J. R.
82-001016
Paxton, R.
82-000140
Payan, P.
82-000094
Payne, G.
82-001347
Payne, J. F.
82-001133
Payne, N. R.
82-000772
Payusova, A. N.
82-002331
Pearcy, W. G.
82-000911
Pearre, S., Jr.
82-001659
Pearson, R. E.
82-000264
Pechkurenkov, V. L.
82-002807
Peck, L. W.
82-001043
Peck, T. H.
82-000405
Peden, A. E.
82-000321
82-000322
82-001017
82-001720
Pekkarinen, M.
82-002332
Pelaez, J.
82-000499
Pelczarski, J. E.
82-001832
Pelitz, L. R.
82-002517

# AUTHOR INDEX

Pelizaro, M. G.
82-002305
Penaz, M.
82-000010
Penczak, T.
82-002058
82-002596
Pennington, C. H.
82-001212
Penrose, D. L.
82-001882
Pepperell, J. C.
82-002033
Pequeno R., G.
82-000323
Perdomo, C.
82-000362
Pereira-Bueno, J. M.
82-001806
82-001807
Peres, G.
82-002363
Perez Comas, J. A.
82-002642
Perez-Palomo, M.
82-002320
Peringer, P.
32-000118
Perkins, M. A.
82-000414
Perlmutter, A.
82-000142
82-000724
Peron, M.
82-002164
Perrin, J. F.
82-000319
Perrotta, R.
82-000495
Persat, H.
82-000295
82-000319
82-001191
Persson, L.
82-001478
Persson, L.-E.
82-000929
Persson, P.
82-003025
Pertschuk, L. P.
82-002341
Perttila, M.
82-002808
Pesaro, M.
82-000815
Pesonen, S.
82-001502
Pestrak, J. M.
82-000731
Petenusci, S. O.
82-000100
Peter, R. E.
82-000565
82-000719
82-002323
Peterman, R. M.
82-001689
82-002975
Peters, D. S.
82-002272
Peters, E. J.
82-001678
82-002016
Peters, H. M.
82-001578
Peters, J. C.
82-001962
Peters, R. H.
82-001869
Peterson, M. E.
82-001043
Peterson, N. P.
82-002436
82-002525
Peterson, R. E.
82-002816
Peterson, R. H.
82-002563
82-002794
Pettersson, K.
82-001479
Pettit, R. D.
82-001650
Petukhov, S. A.
82-000435
Petzel, D. H.
82-002333
Peute, J.
82-001417
82-002167
Pevtsova, E. I.
82-001480
Pharo, C. H.
82-000040
Phelps, S. R.
82-000761
82-000769
82-001540
Philipp, D. P.
82-000778
82-001255
82-002383
Phillips, G. L.
82-001721
82-001957
Phillips, P. C.
82-000979
82-001722

## AUTHOR INDEX

Phillips, R. R.
82-000195
Phipps, G. L.
82-001120
82-001930
Pic, P.
82-000094
82-000661
82-000720
Pica, A.
82-000721
Pick, F. R.
82-001347
Pickering, A. D.
82-000722
82-002226
Pickford, G. E.
82-001411
Pickmere, S.
82-001347
Picquelle, S. J.
82-000231
Pidgeon, R. W. J.
82-000930
Pienaar, U. de V.
82-001723
Pierce, R. B.
82-002955
Pietsch, T. W.
82-000351
82-001000
82-001018
Pigott, G. M.
82-000556
Pihu, E.
82-001238
Pillai, P. K. M.
82-002422
82-002539
Pillai, S. K.
82-002185
82-002643
82-002644
Pinchuk, V. I.
82-000352
Pinchukov, L. A.
82-002369
Pincock, D. G.
82-001518
Pinhorn, A. T.
82-003011
Pinto, L.
82-002066
Pirogovskiy, M. I.
82-002472
Piron, R. D.
82-002178
Pirozhnikov, P. L.
82-002564
Pita, M. L.
82-002318
82-002319
Pitchairaj, R.
82-000553
Pitt, R.
82-002108
Pittman, K.
82-000583
Pitts, P. A.
82-000816
Platt, T.
82-000587
82-000588
Platts, W. S.
82-001177
82-002880
82-002905
Plavnik, I.
82-000523
Ploskey, G. R.
82-002473
Plotnikoff, M. D.
82-002085
Plumb, J. A.
82-001047
82-002747
82-002748
Poddubnyy, A. G.
82-000279
Poe, P. H.
82-000228
Poe, W. E.
82-002082
Pohla-Gubo, G.
82-002851
Poirier, G. R.
82-002179
Poirier, S. H.
82-001137
Poletti, R.
82-002791
Polgar, T. T.
82-000931
82-001220
Policansky, D.
82-001481
Pollard, J. F.
82-000455
Pollock, B. R.
82-000898
82-002437
Poluhowich, J. J.
82-000098
Pond, V.
82-001941
Ponniah, A. G.
82-000553
Pontier, P. J.
82-000675

# AUTHOR INDEX

Pope, J. G.
82-003008
Popma, T. J.
82-001482
Popper, A. N.
82-001360
82-001553
Portanova, R.
82-001402
Porter, P. E.
82-002939
Porter, R. C.
82-000622
Portsev, P. I.
82-000280
Poss, S. G.
82-002183
82-002704
Post, A.
82-001724
Post, G.
82-001131
Poston, H. A.
82-002096
Poston, T. M.
82-001863
Potter, E. C. E.
82-003021
Potter, H. T.
82-002334
Potter, I. C.
82-000062
82-000087
82-000286
82-001454
82-001455
82-002306
Pottinger, T. G.
82-000722
Potts, G. W.
82-000281
Powell, T. G.
82-002008
Power, G.
82-000843
82-001161
82-002430
82-002435
Power, M.
82-000807
Power, M. E.
82-001660
Powers, D. A.
82-001400
Poxton, M. G.
82-000541
Poysky, F. T.
82-001043
Pozo, E.
82-000296
Prabhakara Rao, A. V.
82-002065
Prasad, M. S.
82-000733
Prasad, R.
82-002376
Prasad, R. R.
82-002069
Prasad, S.
82-002597
Prasada Rao, P. D.
82-002186
Prasannakumari, B.
82-002921
Pratt, H. L., Jr.
82-001551
82-002438
Prel, E. T.
82-002312
Prentice, J. A.
82-001690
Prepas, E. E.
82-001346
Prepejchal, W.
82-000737
82-001108
Prete, P. J.
82-000411
Prewitt, C. G.
82-001273
Price, D. G.
82-002639
Priemer, J.
82-002780
Prieto, A.
82-002725
Prihoda, J.
82-000010
Prikhod'ko, B. I.
82-002956
Prince, E. D.
82-001172
Pritchard, J. B.
82-001483
Prits, A. K.
82-002976
Prokes, M.
82-000297
Propp, J.
82-002388
Prosser, C. L.
82-000192
Protasov, V. R.
82-002809
Protopopov, N. K.
82-000298
Provancha, M.
82-000982
Puffer, H. W.
82-002810

# AUTHOR INDEX

Pullin, R. S. V.
82-002377
Purdom, C. E.
82-000782
Purdy, E. J., Jr.
82-001349
Putnam, M. E.
82-000426
Puviani, A. C.
82-001475
Puyear, R. L.
82-001902
Py-Daniel, L. H. R.
82-002705
Pyysalo, H.
82-002604
Qadri, S. U.
82-002603
82-002813
Qianru, C.
82-001370
Quinn, S. P.
82-002598
Quinn, T. J. II
82-002000
Quinn, T. P.
82-000827
82-001579
Quiros, R.
82-000490
Raa, J.
82-000011
82-001423
Rab, P.
82-000168
82-000169
Rabelahatra, A.
82-001297
Rabinovitch, P. S.
82-002388
Rach, J. J.
82-002922
Radhakrishnan Nair, P. N.
82-002577
Radtke, R.
82-001701
Radtke, R. L.
82-001691
Rafn, S.
82-000071
Rahimov, D. B.
82-001019
Raina, H. S.
82-002505
Rainford, E. A.
82-002341
Raisanen, G. R.
82-000519
Raknes, A.
82-000977
Ralston, S.
82-002957
Ralston, S. V. D.
82-001620
Ram, N. M.
82-000534
Ramaiyan, V.
82-002439
Ramamohana Rao, G.
82-002065
Ramamurthy, S.
82-002063
Ramanathan N.
82-002439
Ramsey, H.
82-001086
Ramsey, J. S.
82-000786
Rance, T. A.
82-002335
Rand, R. H.
82-000651
Randall, D. J.
82-001484
Randall, H. A.
82-000353
Randall, J. E.
82-000353
82-001020
82-001021
82-001761
82-001765
82-001766
82-001767
82-002706
Randall, R. G.
82-000229
82-002440
82-002474
Randolph, J.
82-000451
Rao, D. M.
82-000441
Rao, G. S.
82-003018
Rao, K. H.
82-002193
Rapoport, T. A.
82-000690
Rappaport, U.
82-000036
82-000560
Rasch, E. M.
82-002384
Raschi, W.
82-000623
Rasin, V. J., Jr.
82-001251
82-001465

# AUTHOR INDEX

- Ratitskaya, L. V.
  - 82-002224
- Rau, N. E.
  - 82-001070
  - 82-002757
- Reader, N. A.
  - 82-000256
- Reagan, R. E., Jr.
  - 82-000535
- Reckahn, J. A.
  - 82-000837
- Reddanna, P.
  - 82-000431
- Reddy, Y. S.
  - 82-002823
- Reed, J. K.
  - 82-000257
- Reed, R. B.
  - 82-001226
- Reetz, S. D.
  - 82-002987
- Refstie, T.
  - 82-002385
- Regier, H. A.
  - 82-000444
  - 82-001161
  - 82-001241
- Regis, J.
  - 82-000473
- Reice, S. R.
  - 82-000042
- Reichenbach-Klinke, H.-H.
  - 82-000324
- Reichert, W. L.
  - 82-001134
  - 82-002861
- Reid, G. M.
  - 82-000354
  - 82-002187
- Reiling, S. D.
  - 82-000457
  - 82-001968
- Reilly, C. A.
  - 82-001725
- Reimchen, T. E.
  - 82-001856
- Reinthal, P.
  - 82-002699
- Reisenbichler, R. R.
  - 82-001202
- Reiser, D. W.
  - 82-002811
- Rendell, C. A.
  - 82-001897
- Renfro, J. L.
  - 82-001485
- Rengaswamy, V. S.
  - 82-002599
- Renou, P.
  - 82-001323
- Repko, F. F.
  - 82-000400
- Reshetnikov, Yu. S.
  - 82-000341
  - 82-000468
- Rettenwander, R.
  - 82-000685
- Retzer, M. E.
  - 82-002386
- Rey, F.
  - 82-000909
- Reynolds, L. F.
  - 82-002524
  - 82-002600
- Reynolds, R. P.
  - 82-000310
- Reynolds, W. W.
  - 82-000196
  - 82-000799
  - 82-000817
  - 82-001486
  - 82-002411
- Rhee, G-Y.
  - 82-001876
  - 82-001877
- Rhoderick, J. C.
  - 82-000436
- Rhone, J. P.
  - 82-001996
- Ribbink, A. J.
  - 82-000260
  - 82-002707
- Ribick, M. A.
  - 82-001103
- Rice, G. K.
  - 82-000405
- Richard, M.
  - 82-000515
- Richards, J. E.
  - 82-002708
- Richards, W. J.
  - 82-000216
  - 82-001597
- Richardson, L. B.
  - 82-000436
- Richardson, S. L.
  - 82-000355
  - 82-002592
- Richkus, W. A.
  - 82-001263
- Richter, C. J. J.
  - 82-002109
- Rickard, N. A.
  - 82-001986
- Rickards, W. L.
  - 82-000014
  - 82-000139
- Ricker, W. E.
  - 82-001252

# AUTHOR INDEX

Riddle, L. M.
82-001804
Ridlington, J. W.
82-001135
Rieman, B. E.
82-002901
Rigler, F. H.
82-001164
82-001346
82-002881
Rikhter, V. A.
82-002862
Rimmer, D. M.
82-000197
Rimon, A.
82-002070
82-002071
Ring, O.
82-001476
Ringler, N. H.
82-001661
Rinne, J. N.
82-000501
82-000899
82-001165
82-001718
82-002877
82-002906
Rinne, W. E.
82-000844
Ripple, K.
82-000933
Risk, M. J.
82-000818
Rivas, L. R.
82-001269
82-002188
Rivera, E. R.
82-001367
Robb, A. P.
82-001378
Robbins, W. H.
82-000812
Roberts, D.
82-001447
Roberts, L. B.
82-001365
Roberts, M. H., Jr.
82-002852
Roberts, R. J.
82-001125
Roberts, T. R.
82-001768
82-001769
82-002189
82-002678
Robertson, A. I.
82-001692
Robertson, D. A.
82-000052
Robertson, D. R.
82-000198
82-000723
82-000900
Robin, J. H.
82-000546
Robinette, H. R.
82-000557
82-002082
Robins, C. R.
82-001022
Robinson, E. H.
82-002082
Robinson, T. P.
82-002110
Robison, H. W.
82-001716
Robison, W. A.
82-001246
Roboni, M.
82-002792
Robotham, P. W. J.
82-000932
Roch, M.
82-001897
82-001923
Roche, D. P.
82-000377
Rodgers, D. W.
82-000412
82-002812
82-002813
Rodgers, J.
82-002041
Roff, J. C.
82-000905
Rogers, S. C.
82-001518
Rohde, F. C.
82-002441
Rohovec, J. S.
82-002716
82-002734
Roitblat, H. L.
82-000819
Rojas-Galaviz, J. L.
82-002588
Rolfe, M. S.
82-001879
82-002817
Roline, R. A.
82-002814
82-002815
Roman, B.
82-002980
Romanenko, V. D.
82-000141
Rombauts, R.
82-000515

## AUTHOR INDEX

Rombough, P. J.
82-002853
Romero-Herrera, A. E.
82-001487
Rosa-Molinar, E.
82-000980
Rose, S. T.
82-000266
Rosen, D. E.
82-001360
Rosen, M. H.
82-000142
82-000724
Rosen, R.
82-001067
Rosen, R. A.
82-000845
82-001084
Rosenberg, A. A.
82-002592
82-002601
Rosenthal, H.
82-000881
82-000915
Rosko, J. J.
82-002981
Ross, D. A.
82-003022
Ross, J. L.
82-000456
82-001662
82-002602
Ross, L. G.
82-000262
Ross, M. A.
82-000784
Ross, M. J.
82-000820
82-001192
Ross, M. R.
82-002598
Ross, Q.
82-002927
Ross, R. M.
82-002336
Ross, S. W.
82-001726
Rothbard, S.
82-000536
82-000569
82-000725
82-001298
Roubal, F. R.
82-001085
Rounick, J. S.
82-000487
Roussel, J. E.
82-001207
Roux, A. L.
82-000319
Rowell, D. M.
82-001488
Royalty, J. L.
82-002419
Roys, R. S.
82-001280
82-002944
Rozenvasser, Y. M.
82-002442
Rubec, L. A.
82-001068
Rubec, P. J.
82-002603
Rubitschun, C.
82-000579
Ruby, S. M.
82-001918
Rudner, T. W.
82-002832
Rudometkina, G. P.
82-000072
82-002190
Ruggieri, G. D.
82-001064
82-001809
Ruiz, L. J.
82-002191
82-002209
Ruiz, R. A.
82-000362
Rumsey, G. L.
82-000029
82-001342
Rutecki, T. L.
82-002958
Ruth, S. B.
82-000980
Ryan, C. J.
82-000589
Ryan, P. A.
82-000325
Ryan, P. M.
82-000413
Ryckman, J. R.
82-002949
Ryder, R. A.
82-000779
82-001239
Ryman, N.
82-000508
82-000780
82-001543
82-002375
Ryzhova, L. N.
82-002337
Saarikoski, J.
82-000437
Sablin, V. V.
82-002526

## AUTHOR INDEX

Sabnai, I.
82-002746
Sacca, R.
82-001489
Sadler, K.
82-000438
Saetersdal, T. S.
82-000061
Saez, L.
82-001490
Safer, A. M. A.
82-002192
Saglio, P.
82-001572
82-002412
Saito, K.
82-000419
Saito, T.
82-000143
Sakagawa, G. T.
82-003023
Sakai, D. K.
82-000144
82-000726
82-000727
82-001491
82-002339
82-002340
82-002735
Sakai, H.
82-002645
Sakai, M.
82-001598
Sakamoto, M.
82-001318
Sakanari, J.
82-001725
Salamastrakis, S. S.
82-002275
Sale, P. F.
82-000230
Saleh, U. B.
82-002604
Saliksyanov, R. F.
82-000113
Salmenkova, E. A.
82-000762
Salmi, J.
82-000860
Salojarvi, K.
82-001240
Saloman, C. H.
82-000278
Samarakoon, J. I.
82-000258
Samaritan, J. M.
82-002443
Sameoto, D.
82-002527
Sammarco, P. W.
82-000818
Samonina, G. E.
82-001480
Samples, K. C.
82-001969
Sanchez-Medina, F.
82-000131
82-002318
82-002319
82-002320
Sanchez-Muniz, F. J.
82-002338
Sanchez, R. P.
82-000242
82-000243
Sandercock, F. K.
82-000520
Sanders, J. E.
82-002734
Sandifer, P. A.
82-001737
Sandnes, K.
82-000145
Sangalang, G.
82-001906
Sangster, G. I.
82-001988
82-002952
Sanh, T. D.
82-000265
Sano, N.
82-001219
Santacana, J. A.
82-000362
Santander, G.
82-001063
Sanz, A.
82-000728
Sargent, P. A.
82-002260
Sargent, R. C.
82-001633
Sarig, S.
82-001281
82-002055
Sarma, P. S. S.
82-002919
Saroglia, M. G.
82-000672
Sartoris, J. J.
82-000576
82-001959
Sasaki, K.
82-000439
82-001931
Sasaki, S.
82-000326
82-002409

## AUTHOR INDEX

Sastry, K. V.
82-002854
Sastry, Y. A.
82-003018
Sato, A.
82-001146
Sato, H.
82-001459
Sato, M.
82-000756
82-000757
82-001492
82-002097
82-002645
Sato, O.
82-000813
Sato, T.
82-002838
Sato, Y.
82-002169
Satamadjis, J.
82-002819
Saunders, R. L.
82-000110
82-000889
82-001253
Savchenko, N. V.
82-002413
Savino, J. F.
82-001663
Savitz, J.
82-001664
82-001665
Savoie, L. B.
82-002528
Savvaitova, K. A.
82-000341
82-001015
Sawada, T.
82-002903
Sawaya, P.
82-000100
Sawyer, E. S.
82-001309
Sawyer, P. J.
82-001309
Saxena, A. B.
82-002855
Saxena, O. P.
82-002342
Sayfullin, R. R.
82-000146
Sazonov, Yu. I.
82-000356
Sbikin, Y. N.
82-002414
Scarlett, P. G.
82-001277
Schaefer, W. F.
82-001693

Schene, T.
82-000309
Schenkel-Brunner, H.
82-000115
Schenone, G.
82-002849
Schiavone, A., Jr.
82-001694
82-002979
Schlesinger, A. B.
82-001996
82-002987
Schlesinger, D. A.
82-001241
Schlieker, V.
82-000249
Schlosser, I. J.
82-002907
Schmid, W. D.
82-001721
Schmidt, D.
82-001666
Schmidt, R. E.
82-000981
82-002443
82-002444
Schmidt, S. P.
82-001493
Schmitt, D. N.
82-001695
82-001987
Schmitt, R. J.
82-002565
Schneeberger, P. J.
82-002958
Schnute, J. T.
82-001981
Schofield, C. L.
82-001892
Scholes, P.
82-001991
Schom, C. B.
82-000994
Schrader, G. C.
82-001352
Schramm, H. L., Jr.
82-001212
Schreck, C. B.
82-000521
82-000736
82-001285
82-001504
82-001505
82-002381
Schreiber, D. C.
82-002566
Schreibman, M. P.
82-001494
82-001495

# AUTHOR INDEX

...CONTINUED...
Schreibman, M. P.
82-002341
Schreiner, D. R.
82-002695
Schrock, H.
82-000729
Schultz, M. E.
82-001136
Schultz, R. J.
82-001136
Schultze, H.-P.
82-000624
Schulz, D.
82-001328
Schurr, K.
82-001115
Schutsky, R. M.
82-001349
Schwalb-Buhling, A.
82-001320
Schwantes, A. R.
82-001496
82-001497
82-002249
Schwantes, M. L. B.
82-001496
82-001497
82-002249
Schwartz, E.
82-000642
Schwartz, F. J.
82-000982
82-002646
Schwedler, T. E.
82-002747
82-002748
Schweigert, J. F.
82-000073
82-002977
Schwenzer, D.
82-000509
Schwerzel, S. W.
82-002876
Schwille, E. M.
82-001963
Sciliano, M. J.
82-002321
Scott, A. L.
82-001802
Scott, A. P.
82-000730
Scott, D. B. C.
82-000888
Scott, D. P.
82-000449
82-002892
Scott, G. I.
82-000253
Scott, J. S.
82-001038

...CONTINUED...
Scott, J. S.
82-002415
82-002724
Scott, M. E.
82-002781
Scrivener, J. C.
82-001637
Seabloom, R. W.
82-001717
Seagle, H. H., Jr.
82-001599
Sealing, C.
82-003035
Secombes, C. J.
82-001498
Seeb, J.
82-001541
Seehorn, M. E.
82-001964
Sehgal, K. L.
82-002630
Seigel, J. A.
82-000625
Seikai, T.
82-001932
Sekerak, A. D.
82-001600
Seki, H.
82-000474
Seki, J.
82-001640
Sekitani, T.
82-000200
Selgeby, J. H.
82-002009
Sellner, P. A.
82-001499
Selmer-Olsen, A. R.
82-001864
Sen, P. R.
82-002152
Senanayake, F. R.
82-001166
Sengupta, S.
82-001053
82-001079
Senn, D. G.
82-000074
Serebryakova, Ye. V.
82-000171
Serns, S. L.
82-001746
82-002667
82-002870
82-002959
82-003036
Seshappa, G.
82-002605
Sesso, A.
82-000049

# AUTHOR INDEX

Seth, R. N.
82-000022
Setlow, R. B.
82-001941
Setzler-Hamilton, E. M.
82-000933
Sever, D. M.
82-000974
Sewell, S. A.
82-002647
Seymour, E. A.
82-000021
Shaboneyev, I. Ye.
82-000357
Shackley, P. E.
82-002395
Shafi, M.
82-000846
Shafik, M. M.
82-002007
Shafland, P. L.
82-000731
82-002165
82-002362
Shakour, A. A.
82-000951
Shang, Y. C.
82-000004
Shaposhnikova, G. Kh.
82-000341
Shariff, M.
82-001054
Sharma, B. K.
82-002342
Sharma, D. C.
82-001933
Sharma, P. K.
82-001933
Sharma, S. C.
82-002186
Sharma, S. K.
82-002854
Sharp, G. D.
82-003008
Sharp, J. R.
82-001934
82-002797
Shaw, E.
82-000797
Shaw, R. F.
82-000304
82-000983
Shaw, W.
82-000854
Shcherbina, T. V.
82-002369
Shea, T. B.
82-001935
Shealy, M. H., Jr.
82-001737
...CONTINUED...
Shealy, M. H., Jr.
82-002665
Shearer, W. M.
82-002040
Sheehy, D. J.
82-002908
Sheel, M.
82-001379
Shefler, D.
82-002648
Shekhanova, I. A.
82-002841
Sheldon, J. M.
82-000198
Shell, E. W.
82-000013
Shelldrick, E. L.
82-000730
Shelley, J. J.
82-002997
Shelton, D. W.
82-001145
Shelton, G.
82-001425
Shelton, W. L.
82-000572
82-001542
82-002911
Shen, M. W.
82-002388
Shepard, J.
82-002770
82-002940
Shephard, K. L.
82-000732
Shepherd, J. G.
82-002001
Sherk, J. A., Jr.
82-001105
Shibata, T.
82-000706
Shilo, M.
82-002070
82-002071
Shimamura, T.
82-001213
Shimazaki, K.
82-000326
Shimizu, C.
82-001459
82-001509
82-001510
Shimizu, I.
82-001640
82-001801
Shimizu, M.
82-000872
82-001639
Shimizu, S.
82-002953

# AUTHOR INDEX

...CONTINUED...
Shimizu, S.
82-002954
Shimma, H.
82-002343
Shimma, Y.
82-002343
Shireman, J. V.
82-000001
Shirley, K.
82-001704
Shleyfer, G. S.
82-002831
Shlossman, P. A.
82-000847
Shomura, R. S.
82-002034
Shoubridge, E. A.
82-000147
Shpigel, M.
82-000821
Shrestha, J.
82-001727
Shrode, J. B.
82-000822
Shtaf, L. G.
82-001577
Shterman, L. A.
82-002237
Shubat, P. J.
82-001137
Shukla, J. P.
82-000814
82-001929
Shum, G.
82-002775
Shute, J. R.
82-001728
82-002445
Shute, P. W.
82-001728
82-002445
Shuttleworth, T. J.
82-001937
Shyamasundari, K.
82-002193
Sibbing, F. A.
82-001667
Sideleva, V. G.
82-000075
Sidell, B. D.
82-000150
82-000694
Siebenaller, J. F.
82-001500
82-002344
Sieswerda, P. L.
82-000026
Sil'yanova, Z. S.
82-002506
Sill, B. L.
82-000070
Sills, J. B.
82-002868
Silvalingam, P. M.
82-001936
Silver, W. L.
82-002345
Silvert, W.
82-002002
Simco, B. A.
82-001511
82-001811
82-001899
Simon, R. C.
82-000784
82-001154
Simonazzi, M. A.
82-002470
Simoneau, M.
82-002536
Simons, D. B.
82-001965
Simpson, C. F.
82-000420
Simpson, K.
82-000476
Simpson, K. L.
82-000156
Simpson, T. H.
82-000689
Sims, S. E.
82-001227
82-002003
Sin, A. W.
82-002072
82-002821
Sinclair, A.
82-000955
Sinclair, M.
82-000864
82-000955
Singh, B. B.
82-001138
Singh, B. R.
82-000733
82-001379
82-002194
Singh, H. R.
82-000903
Singh, I.
82-001379
Singh, I. J.
82-001418
Singh, N. N.
82-002856
Singh, R. P.
82-000733
82-002194

Singh, S. M.
82-001936
Singh, S. P.
82-000022
Singh, U. N.
82-000597
Sinha, D. P.
82-002597
Siniff, D. B.
82-000820
Sinnhuber, R. O.
82-002090
Sire, J. Y.
82-000617
Sire, J.-Y.
82-000626
Sirotek, D.
82-000056
Siskind, B.
82-001107
Sissenwine, M. P.
82-000445
Sivak, J. G.
82-001580
Sivertsen, A.
82-001864
Sivtseva, L. V.
82-002195
Sjoblom, V.
82-000855
82-000856
82-000869
82-000870
82-000871
82-002471
82-002475
Skelton, P. H.
82-001023
Skinner, J. M.
82-002945
Skow, L. C.
82-000148
Skubich, M.
82-002018
Slanke, V. P.
82-002372
Slaughter, D.
82-000106
82-002261
82-002262
Slinger, S. J.
82-000683
82-002086
Sloane-Richey, J.
82-000414
Slooff, W.
82-000734
Smagula, C. M.
82-002346

...CONTINUED...
Smagula, C. M.
82-002567
Smail, D. A.
82-001822
Small, D. P.
82-000003
Smirnov, S.
82-002173
Smith-Vaniz, W. F.
82-001010
Smith, B. H.
82-002991
Smith, B. W.
82-001178
Smith, C.
82-001086
Smith, C. E.
82-001081
Smith, C. L.
82-002463
Smith, D.
82-000477
Smith, D. C.
82-000003
82-001696
82-002270
Smith, F. M.
82-001501
Smith, G. B.
82-001729
Smith, G. F.
82-001352
Smith, G. R.
82-000961
Smith, J. E.
82-001183
82-001472
Smith, J. F.
82-000638
Smith, J. J.
82-002639
Smith, J. W.
82-002416
Smith, K. L., Jr.
82-002351
Smith, M. M.
82-001765
Smith, N. K. R.
82-000440
Smith, P. E.
82-000217
Smith, R. J. F.
82-001581
Smith, R. L.
82-001871
Smith, R. P.
82-000956
Smitherman, R. O.
82-001288

...CONTINUED...
Smitherman, R. O.
82-001299
82-002378
Smitheon, T. R.
82-000627
Smoker, W. W.
82-002387
Snegaroff, J.
82-002347
Snelson, F. F., Jr.
82-000848
82-001697
Snetkov, M. A.
82-000468
Snow, H. E.
82-002929
Snow, J. R.
82-000558
Snyder, D. E.
82-001024
Snyder, W. S.
82-000849
Soderberg, R. W.
82-001341
Soebiantoro, B.
82-000559
Soeda, H.
82-001213
Soholt, L. F.
82-001107
Soin, S. G.
82-002196
Soivio, A.
82-000621
82-000712
82-000735
82-001502
82-001512
Sokabe, H.
82-001471
Sokolov, L. I.
82-000171
Sokolova, M. M.
82-002308
Sokolovskaya, T. G.
82-002649
Sokolovskiy, A. S.
82-002649
Sokolowska, M.
82-002348
Solangi, M. A.
82-001055
82-001139
Solbakken, J. E.
82-001140
Solomon, G.
82-000872
Solsona, C.
82-000149
Soltitskaya, L. P.
82-002059
Somasekharan Nair, K. V.
82-002507
Somero, G. N.
82-001500
82-002344
Somiya, H.
82-002197
Sommer, D. A.
82-002816
Sommerville, C.
82-001835
82-001836
Somvanshi, V. S.
82-002185
82-002643
Sonina, M. A.
82-002607
Sonski, A. J.
82-001503
Sonstegard, R. A.
82-001917
82-002301
Sorensen, E. M. B.
82-000440
Sorokin, M. A.
82-002403
Sosiak, A. J.
82-001582
Souchon, Y.
82-001290
Sousa, R. J.
82-001167
Southward, G. M.
82-002000
Souza Santos Filho, P. de
82-002198
Souza Santos, H. L. de
82-002198
Souza, P.
82-000931
Sower, S. A.
82-001285
82-001504
82-001505
Spangler, G. R.
82-000767
82-000775
82-001168
Specker, J. L.
82-000736
Spieler, R. E.
82-001486
Spigarelli, S. A.
82-000737
82-001108
82-001218
82-001873

# AUTHOR INDEX

Sporka, F.
82-002633
Sprague, J. B.
82-002837
82-002857
Springer, V. G.
82-000358
Spry, D. J.
82-002837
Squire, J. L., Jr.
82-002417
Sreenivasan, P. V.
82-002446
82-002772
Srinivasarengan, S.
82-002650
Srivastav, S. P.
82-000742
Srivastava, A. K.
82-002856
Srivastava, K. P.
82-000022
Srivastava, P. N.
82-001109
Stacey, N. E.
82-000738
82-001601
Stadler, H.
82-001436
Stagg, R. M.
82-001937
Stahl, G.
82-000780
82-001543
82-002375
Stanford, J. A.
82-000411
82-002985
Stanford, R. M.
82-002965
Stange, D.
82-002883
Stanley, J. G.
82-000463
Starnes, L. B.
82-001730
Stasiak, R. H.
82-001534
82-001602
States, J. B.
82-001900
Stauffer, G. D.
82-000231
Stauffer, J. R., Jr.
82-001096
82-001865
82-002799
Stauffer, T. M.
82-000475
...CONTINUED...
Stauffer, T. M.
82-000830
82-001735
Stayton, R. L.
82-002904
Steene, R. C.
82-000317
Steffensen, J. F.
82-000739
82-002231
Steimle, F. W., Jr.
82-002568
Stein, D. L.
82-000218
Stein, J. E.
82-002861
Stein, R. A.
82-001663
Steinhaus, V. S.
82-001731
82-001732
82-001733
82-001734
Steinmueller, M. H.
82-002965
Stelt, A. van der
82-002176
Stendahl, D. H.
82-002857
Stenson, J. A. E.
82-000995
Stephens, J. S., Jr.
82-000822
Stephens, R. T. T.
82-000850
Sterba, O.
82-000063
Stetson, M. H.
82-001391
Stevens, D. G.
82-001868
Stevens, E. D.
82-001506
Stevenson, D. K.
82-001270
82-002651
Stevenson, R. M. W.
82-001803
Stewart, D. J.
82-000282
Stiassny, M. L. J.
82-002709
Stickney, R. R.
82-000527
82-000548
82-001215
82-001303
Stillwell, C. E.
82-001668

# AUTHOR INDEX

Stirn, J.
82-001884
Stobo, W. T.
82-000895
Stocker, M.
82-000481
Stone, B. B.
82-000150
Stone, J. H.
82-002455
Stone, M. D.
82-002884
Stone, R. B.
82-002909
Stone, W. B.
82-001698
Stoneking, M.
82-000359
Stoner, A. W.
82-000934
Storck, T.
82-001684
Storck, T. W.
82-001966
Storozhuk, N. G.
82-000435
Stoss, J.
82-002385
Stott, F. C.
82-002652
Stout, R. B.
82-001787
Strait, L. E.
82-001283
Strand, S. W.
82-002565
Strange, C. D.
82-001569
Strange, E. S.
82-001992
Strauss, R. E.
82-001669
Strawn, K.
82-001092
82-001300
Stribley, J. A.
82-001602
Stroband, H. W. J.
82-000151
Struthers, G.
82-000262
Stucky, R. K.
82-001770
Stuiber, D. A.
82-002816
Suarez, R. K.
82-000152
Subba Rao, D.
82-002855
Subina, L. I.
82-002606
Sugimoto, N.
82-000371
Sugita, H.
82-002349
82-002350
Sugiwaka, K.
82-002182
82-002529
82-002737
82-002753
Sugiyama, A.
82-000369
82-000372
82-001046
Sukhanov, V. V.
82-002608
Sullivan, C. R.
82-000450
Sullivan, E.
82-000454
Sullivan, J. R.
82-001141
Sullivan, K. M.
82-002351
Sullivan, W. L., Jr.
82-003024
Sumantadinata, K.
82-001544
82-001545
Suminski, R. R.
82-000866
Summers, G. L.
82-000935
Summers, J. K.
82-001263
Sumner, M. W.
82-002047
Sumpter, J. P.
82-002253
82-002301
Sunada, J. S.
82-000232
Sund-Laursen, J.
82-002267
Sundararaj, B. I.
82-000740
82-001446
82-002352
Sunder, S.
82-002508
82-002630
Sundquist, J.
82-002234
Suo, L.
82-001857
Surat, E.
82-001460

# AUTHOR INDEX

Surat, E. M.
00-000000
Suriano, D. M.
82-001858
Suszycka, E.
82-002596
Sutterlin, A. M.
82-000889
Sutton, R. J.
82-000537
Suuronen, P.
82-000856
82-000873
Suzuki, A.
82-001545
Suzuki, K.
82-000076
82-000153
82-000154
82-000219
82-002278
82-002509
Suzuki, M.
82-000741
82-001208
Suzuki, T.
82-000498
82-001931
Suzuki, Y.
82-000549
Svensson, K. M.
82-001780
Svetovidov, A. N.
82-001025
Svirsky, A. M.
82-000700
Swain, A.
82-001634
82-003021
Swanson, B. L.
82-002010
Swanson, R. N.
82-001113
Swarup, K.
82-000742
Swarup, P. A.
82-000441
Swears, S. B.
82-000195
Swenson, W. A.
82-001562
82-001693
Swift, D. J.
82-002353
82-002354
82-002355
Swink, W. D.
82-002940
Swinney, G. N.
82-000781

...CONTINUED...
Swinney, G. N.
82-001026
Syed, M. A.
82-002356
Sylvester, J. R.
82-002858
Symons, P. E. K.
82-003023
Syrett, R. F.
82-002042
Szabc, T.
82-000191
Szelistowski, W. A.
82-000715
Szeto, S. Y.
82-001142
Tabachek, J. L.
82-000554
Tabata, M.
82-001507
82-001508
Tacon, A. G. J.
82-000035
Tagagi, T.
82-002328
Tagart, J. V.
82-002973
Taipalinen, I.
82-001106
Takabatake, I.
82-002280
Takahashi, H.
82-000743
Takahashi, M.
82-000199
82-000200
Takama, K.
82-000635
82-001392
Takano, K.
82-002181
82-002199
Takatsuji, K.
82-002169
Takeda, H.
82-001509
82-001510
Takeda, M.
82-000439
82-001931
Takeda, T.
82-001332
Takeuchi, T.
82-000561
82-000562
82-000563
Taki, Y.
82-001336
Takvorian, P. M.
82-001056

# AUTHOR INDEX

Talbot, J. W.
82-002817
Talhelm, D. R.
82-002965
Tallman, R. F.
82-001670
Tamaoki, B.
82-000153
Tamaoki, B.-I.
82-000154
Tamoto, Y.
82-001587
Tanabe, S.
82-002088
Tanaka, H.
82-002529
Tanaka, K.
82-000299
82-000629
Tanaka, M.
82-001631
Tanaka, S.
82-000804
82-002200
Tanaka, Y.
82-000037
82-000076
82-000156
82-000219
82-002278
82-002509
Tandjung, S. D.
82-002859
Tandler, A.
82-001329
Tandon, K. K.
82-002629
Tang, Y.
82-002960
Taniguchi, N.
82-001544
82-001545
Taniuchi, T.
82-000241
Tarapchak, S. J.
82-000579
Tarifeno-Silva, E.
82-000396
82-000404
82-000415
82-000416
Tatner, M.
82-001792
Tatner, M. F.
82-002201
Taubert, B. D.
82-001699
Tave, D.
82-001299
Tavolga, W. N.
82-000823
Taylor, A. C.
82-000644
Taylor, D. H.
82-002206
Taylor, J. D.
82-002170
Taylor, J. L.
82-000457
82-001968
Taylor, K. W.
82-001143
82-002830
Taylor, L. R.
82-000202
Taylor, L. Y.
82-002727
Taylor, M. C.
82-001143
82-002830
Taylor, M. H.
82-002300
Taylor, M. W.
82-002111
Taylor, T. L.
82-002639
Taylor, W. W.
82-000233
82-000779
Tazawa, T.
82-002838
Tchen, T. T.
82-002170
Teng, S. K.
82-001306
Teranishi, T.
82-000743
82-001376
82-001467
Terashima, A.
82-002910
Teravainen, T.
82-001502
Terlou, M.
82-002227
Terry, D. O.
82-002093
Terry, J. M.
82-001970
Tervet, D. J.
82-001110
Tervo, V.
82-002808
Terwilliger, R. C.
82-001429
82-002283
Tesar, F. J.
82-002662

# AUTHOR INDEX

Tesch, F.-W.
82-000213
Teshima, K.
82-000077
Teshima, S.
82-001318
Teskeredzic, Z.
82-000259
Tetens, V.
82-000744
Teugels, G. G.
82-001771
Thakur, N. K.
82-000238
Tham, W.
82-000819
Thatcher, V. E.
82-001859
Theofan, G.
82-000745
Thomann, R. B.
82-002790
Thomas, G. L.
82-000464
82-001583
82-002044
Thomas, J. T.
82-001887
Thomas, P.
82-001144
Thomas, P. A.
82-002923
Thomas, P. C.
82-002860
Thomas, S.
82-002357
Thommes, M. M.
82-000737
82-001108
82-001218
82-001873
Thompson, D.
82-000782
Thompson, J. M.
82-000234
Thompson, J. S.
82-001087
Thompson, K. W.
82-002004
Thompson, N. P.
82-000420
Thompson, P. C.
82-001184
Thompson, R.
82-000577
Thompson, R. S.
82-002637
Thomson, K. S.
82-000627
Thorgaard, G. H.
82-002388
Thorman, S.
82-002569
Thorne, R. E.
82-000484
82-001641
82-002044
Thorpe, J. E.
82-000262
82-000783
82-000784
Thorpe, J. P.
82-002377
Thorson, T. B.
82-000386
82-000957
82-001603
82-002011
82-002317
Threlfall, W.
82-001788
82-001860
Thune, R. L.
82-001047
82-001804
Tidemann, E.
82-000011
Tiews, K.
82-001320
82-001330
Tilley, P. A. G.
82-001147
Tilseth, S.
82-002587
Timashova, L. V.
82-002202
Timmons, T. J.
82-000936
82-002911
Tjelmeland, S.
82-000909
Tocko, M. N.
82-000233
Todd, G. T.
82-000201
Todd, J.
82-002811
Todd, P. R.
82-000027
82-000263
82-001680
Todd, T. N.
82-000785
Toffoli, E. V.
82-001282
Togstad, H. A.
82-002897
Toivonen, J.
82-001242

# AUTHOR INDEX

Tokranov, A. M.
82-002510
Tomasso, J. R.
82-001511
82-001899
Tomioka, K.
82-001801
Tong, S.
82-000746
Tong, W. C. M.
82-000753
Tongiorgi, P.
82-000815
Topping, G.
82-001097
82-001938
Toranzo, A. E.
82-001818
Tormosova, I. D.
82-000235
Torrissen, O.
82-000011
Tort, L.
82-001939
Toth, L. A.
82-001747
Toulorge, J. F.
82-000158
Townsend, B. E.
82-002806
Townsend, D. W.
82-000304
82-000984
Townsend, R.
82-001221
Toyoda, J.
82-000143
Tracey, D. M.
82-000417
Tranquilli, J. A.
82-001699
82-002936
Trautmann, N. M.
82-002012
Tremblay, C.
82-002447
Trendall, J. T.
82-001027
Trent, L.
82-000099
Trevavas, E.
82-001028
Triantaphyllidis, C. D.
82-000170
Tribble, G. W.
82-000890
Tricas, T. C.
82-000202
Tripp, M. R.
82-001036

...CONTINUED...
Tripp, M. R.
82-001037
Trunov, I. A.
82-002710
Trust, T. J.
82-001798
Tsai, C.-F.
82-000442
Tselikova, T. N.
82-002331
Tsepkin, Ye. A.
82-000497
Tsimenidis, N.
82-001687
Tsokur, A. G.
82-002203
Tsuchiya, A.
82-000203
Tsujita, T.
82-000741
Tsukashima, Y.
82-000696
Tubb, R. A.
82-001116
Tucker, J. W., Jr.
82-002204
Tugarina, P. Y.
82-002448
Tulliez, J.
82-001093
Tung, I.-H.
82-001604
Turner, B. J.
82-002384
Turner, D. A.
82-001738
Turner, D. T.
82-000566
82-002074
82-002101
Turner, P. R.
82-000958
Turner, S. C.
82-001206
Turnpenny, A. W. H.
82-000478
Tuurala, H.
82-000621
82-000735
82-001512
Tweddle, D.
82-002653
Tyler, A. V.
82-000954
Tytler, P.
82-002192
U.S. Fish and Wildlife Service
82-002112
82-002982

## AUTHOR INDEX

Uchihashi, K.
82-001380
82-001381
Uchiyama, M.
82-000439
82-000636
82-001931
Ueda, T.
82-002910
Uehara, R.
82-000563
Uematsu, K.
82-002418
Ueno, S.
82-000219
Uhlig, G.
82-000509
Uin, L.
82-001401
Ulanowicz, R. E.
82-001220
Uma Kumari, K.
82-002457
Underhill, J. C.
82-001721
Underwood, H. T.
82-001060
UNESCO
82-001264
Unkenholz, D. G.
82-000845
Uotani, I.
82-000283
Upton, S. J.
82-001819
82-002742
Uraiwan, S.
82-001688
Urdaneta, H. E.
82-001805
Ureena, G.
82-001419
82-002274
Uthe, J. F.
82-002818
Utida, T.
82-000185
Utter, F. M.
82-000772
82-001169
82-002388
Uzmann, J. R.
82-001547
Uznanski, R. L.
82-002782
Vaag, A.
82-002915
Vahl, O.
82-001404
...CONTINUED...
Vahl, O.
82-001405
Vaillant, C.
82-000686
Val, A. L.
82-002249
Valdes, R.
82-002717
Valdes, R. A.
82-001029
Valkeajarvi, P.
82-001242
Valter, G. A.
82-001445
Van Alen, B. W.
82-002205
Van Cauwenberghe, K.
82-001399
Van Den Bosch, R. A.
82-001417
Van den Broek, E.
82-001089
Van den Broek, W. L. F.
82-000417
Van den Hurk, R.
82-001495
Van Den Hurk, R.
82-002109
Van Den Thillart, G.
82-002359
Van den Thillart, G.
82-001513
Van Der Kraak, G.
82-001401
Van Der Veen, F. H.
82-000151
Van Devender, T. R.
82-002637
Van Dyke, J. M.
82-000884
Van Gorder, S. D.
82-000538
Van Hassel, J.
82-001091
Van Korlaar, F.
82-000108
Van Oordt, P. G. W. J.
82-001417
Van Ree, G. E. F.
82-002358
Van Veen, T.
82-002256
Van Waarde, A.
82-000155
82-001513
82-001514
82-001515
82-002359
Van Winkle, W.
82-001621

Vancil, R.
82-001330
82-001584
Vankevich, N. M.
82-002976
Varanasi, U.
82-001134
82-002861
Varela, G.
82-002338
Vargas, A. N.
82-000131
82-002318
82-002319
Vari, R. P.
82-000360
82-001772
Vasil'eva, E. D.
82-001382
Vasil'yev, V. P.
82-000171
Vasil'yeva, Y. D.
82-002711
Vaughan, D. S.
82-001621
Vaughan, T. C.
82-000801
Vaught, R. S.
82-001846
82-001847
Veen, T. van
82-000628
82-000824
Veggetti, A.
82-001393
Veiluva, M.
82-000446
Veith, G. D.
82-000406
Velasquez, C. C.
82-002783
Venkata Subba Rao, K.
82-002712
Venugopalam, W.
82-003018
Vera-Herrera, F.
82-002588
Vera, J.
82-002013
Verhagen, J. H. G.
82-001225
Verheye, H. M.
82-002048
Verma, S. R.
82-000418
Verrue, K. N.
82-002833
Vestergard Jorgensen, P. E.
82-001837
...CONTINUED...
Vestergard Jorgensen, P. E.
82-001838
82-001839
Vetter, R. D.
82-000747
82-001516
Vetter, R. J.
82-001875
Victor, A. C. C.
82-002609
Videler, J. J.
82-001585
Vierke, J.
82-000361
Vigg, S.
82-000852
82-002654
Vijaya, P.
82-002439
Viljanen, M.
82-001622
Villeneuve, D.
82-000991
Villwock, W.
82-002713
Viluksela, M.
82-000437
Vincke, P.
82-002049
Vinjoy, M.
82-002725
Vinyard, G. L.
82-000908
82-000923
82-000937
82-000996
Viola, S.
82-000036
82-000560
82-002098
Vitter, M. W.
82-002811
Vladykov, V. D.
82-001773
Vlieg, P.
82-002360
Vocke, R. W.
82-001107
Vogel, D.
82-000347
Vogelbein, W.
82-001844
Vollenweider, R. A.
82-001343
Volodin, V. M.
82-002495
Von Der Decken, A.
82-002303
von Westernhagen, H.
82-000881

# AUTHOR INDEX

Vondracek, B.
82-000959
82-002361
Voskoboynikova, O. S.
82-000078
[illegible], S. D.
82-001145
Vostradovsky, J.
82-000220
Voutsinou-Taliadouri, F.
82-002819
Vranovsky, M.
82-002988
[illegible], P.
82-000109
Vuorinen, P.
82-002862
Vyas, E. R.
82-001528
Vyshegorodtsev, V. A.
82-000079
Waas, P. B.
82-002076
Wada, N.
82-000561
82-000562
82-000563
Wagner, D. J.
82-000359
Wagner, G. F.
82-002863
Wagner, W. C.
82-001735
82-002511
Wahle, R. J.
82-000264
82-000486
Waiwood, K. G.
82-000124
82-001453
82-002482
Wakabayashi, H.
82-001799
Wakabayashi, M.
82-001146
Wakamatsu, Y.
82-001468
Waksman, J. M.
82-001586
Waldman, B.
82-000825
Waldner, R. E.
82-002785
Waldrop, J.
82-000016
Waldrop, J. E.
82-000496
Walker, A. I.
82-000663
Walker, J. H.
82-001436
Walker, M. G.
82-001520
Walker, M. H.
82-002628
82-002655
82-002924
Walker, R. L.
82-001462
Walker, T. I.
82-002820
Wall, J.
82-003010
Wallace, J.
82-000286
Wallace, R. K., Jr.
82-000706
82-002570
Wallen, P.
82-001517
82-001563
Walsh, S. J.
82-001605
82-002386
Walters, C.
82-000784
Walton, J. M.
82-002912
Walton, M. J.
82-002371
Wandsvik, A.
82-001700
82-001748
Wang, J. C. S.
82-001606
82-001774
Wanjala, B.
82-000899
Wankowski, J. W. J.
82-000300
Wanner, S. R.
82-001740
Waples, R. S.
82-001775
Ward, P.
82-001792
Ward, R. D.
82-001373
82-002380
Ward, W. D.
82-001185
Ware, D. M.
82-000853
Warlen, S. M.
82-000960
Warlow, A. D.
82-000938
Warner, R. M.
82-000924

# AUTHOR INDEX

Warner, R. R.
82-002512
Warren, M. L., Jr.
82-001736
82-002622
Wass, B.
82-001300
Watabe, N.
82-000629
Watanabe, M.
82-001587
Watanabe, T.
82-000561
82-000562
82-000563
82-000630
82-000696
Watanabe, Y.
82-000748
82-000749
Watari, H.
82-000611
Watermann, B.
82-001861
Waters, T. F.
82-000874
Watkins, C. E. II
82-001788
Watson, T.
82-002714
Watson, T. A.
82-001147
Wattendorf, R. J.
82-002362
Watts, W.
82-000262
Wdzieczak, J.
82-002363
Weatherley, A. H.
82-000522
82-001518
82-002269
Weaver, J. E.
82-001989
Weaver, J. W.
82-002163
Webb, J.
82-001455
82-002306
Webb, P. W.
82-000204
82-000826
82-000939
82-001360
82-001588
Weber, J. J.
82-002449
Webley, G.
82-002335
Webster, D. A.
82-000508
82-001203
82-001949
Weddle, G. K.
82-000972
Wehrhahn, C. F.
82-000187
Weihs, D.
82-001585
Weil, C.
82-000641
Weinstein, M. P.
82-002571
82-002646
82-003005
Weis, J. S.
82-001148
82-002864
Weis, P.
82-001148
82-002864
Weisberg, S. B.
82-001519
82-001671
Weiser, W.
82-001324
Weithman, A. S.
82-001186
Weitzman, S. H.
82-000603
Welborn, K. L.
82-000972
Welch, K.
82-001573
Wellington, G. M.
82-002572
Wellner, P. K.
82-001843
Wells, R. M.
82-002229
Wendelaar Bonga, S. E.
82-002364
Wenner, E. L.
82-001737
Wespestad, V. G.
82-001970
82-002035
Westby, G. W. M.
82-000750
Westers, H.
82-001335
Westhaus, P.
82-001607
Westphal, W. V.
82-000214
Wheatley, G. A.
82-000221
Whitaker, D. J.
82-000375

...CONTINUED...
Whitaker, D. J.
82-001777
White, A.
82-002365
White, A. N.
82-002774
White, B. L.
82-001301
White, E.
82-001347
White, F. H.
82-000420
White, F. N.
82-000652
White, P. G.
82-001080
White, R. J.
82-000182
Whitear, M.
82-001571
82-002162
Whitfield, A. K.
82-000044
Whitford, D.
82-002800
Whitman, R. P.
82-000827
Whitmore, D. H.
82-000787
Whitney, R. R.
82-001986
Whitt, G. S.
82-000778
82-001527
82-002374
Whittaker, F. H.
82-001781
Whittaker, V. P.
82-001436
Whittle, D. M.
82-002837
Whoriskey, F. G.
82-000012
Wickstrom, K.
82-002804
Wiederholm, A.
82-002554
Wiegand, R. C.
82-000040
Wieland, C. M.
82-001557
Wiener, V.
82-000028
Wigzil, G. W.
82-001260
Wild, A.
82-000482
Wilde, G. R.
82-001030
Wildish, D. J.
82-001149
82-002547
Wildrick, D. M.
82-001012
Wiley, M. L.
82-000793
Wiley, R. W.
82-000447
Wilkes, P. R. H.
82-001462
Wilkie, D. W.
82-002961
Wilzins, B. T.
82-002926
Williams, C. D.
82-000985
82-000986
Williams, E. H., Jr.
82-000391
82-001862
82-002784
82-002785
Williams, G. H.
82-001993
Williams, I. C.
82-001854
Williams, J. E.
82-000985
82-000986
Williams, J. G.
82-000788
Williams, J. S.
82-001608
Williams, L. B.
82-000391
82-002785
Williams, R.
82-001233
Williams, R. C.
82-001342
Williams, T. D.
82-000054
Williams, U.
82-001914
Williamson, J. H.
82-001302
Williamson, N. J.
82-001274
Willis, D. E.
82-001383
82-001888
Willis, D. W.
82-000564
82-002763
Willoughby, L. G.
82-002736
Wilson, C. A.
82-001701

Wilson, J.
82-001221
Wilson, J. L.
82-000956
82-001738
Wilson, K. C.
82-002897
Wilson, K. H.
82-002610
Wilson, T. C.
82-001193
Wiltzius, W. J.
82-002671
Windell, J. T.
82-000544
Winemiller, K. O.
82-002206
Winfree, R. A.
82-001303
Wingstrand, K. G.
82-000071
Winterbottom, R.
82-001776
Winterbourn, M. J.
82-000487
Winters, G. H.
82-001658
Wirtz, P.
82-000333
Wisely, B.
82-000573
Wishard, L.
82-001541
Wisner, R. L.
82-001762
Wissing, T. E.
82-001111
82-001589
Witham, G.
82-002036
Withler, F. C.
82-000574
Witte-Maas, E. L. M.
82-000940
Wittenberg, D. K.
82-000751
82-000752
Wittenberg, J. B.
82-000751
82-000752
Wittenberg, W.
82-000751
82-000752
Witthames, P. R.
82-001520
Witzell, W. N.
82-000284
Wohlfarth, G.
82-000528
Wohlschlag, D. E.
82-000647
82-001586
Wolf, K.
82-001820
82-002786
Wolf, P.
82-000947
Wolfert, D. R.
82-002983
Wollscheid, J.
82-002228
Wolters, W. R.
82-000172
82-000789
82-000790
Wong, J.
82-001345
Wong, P. T. S.
82-001940
Woo, N. Y. S.
82-000753
Wood, A. B.
82-001102
Wood, C. M.
82-000754
82-001462
82-002315
Wood, J. F.
82-002077
Wood, K. V.
82-001105
Wood, R. J.
82-001609
Woodhead, A. D.
82-001088
82-001941
82-002865
Woodhead, P. M. J.
82-002913
Woods, D. C.
82-001901
Woods, L. C. III
82-000014
Woodward, B.
82-001354
Woodward, J. J.
82-002366
Woodward, S.
82-000003
Woodworth, J.
82-002866
Wooley, C. M.
82-000209
82-002656
Wooten, M. C.
82-001122
Wootten, R.
82-001821

# AUTHOR INDEX

[illegible], R. J.
82-001673
82-002576
[illegible], J. P.
82-000941
[illegible], D. L.
82-002822
[illegible], P. R.
82-002093
[illegible], J. J.
82-001888
Wright, D. A.
82-002321
Wright, D. E.
82-001672
Wright, D. G.
82-001179
Wright, D. I.
82-000942
82-002573
Wright, G. L.
82-001260
Wright, G. M.
82-002207
Wright, J.
82-000764
Wright, R. G.
82-000699
Wright, R. S.
82-000689
82-002367
[illegible], F. J.
82-002120
[illegible]jec, E.
82-002363
[illegible]uff, L. C.
82-001710
[illegible]ki, R. S.
82-000469
[illegible], D. L.
82-001111
82-001589
[illegible], N.
82-001031
[illegible], H.
82-001546
[illegible], J. W.
82-000491
Yakovlev, V. M.
82-002156
Yamada, J.
82-000299
82-000629
82-001565
Yamada, S.
82-000037
82-000156
Yamagata, Y.
82-001942
Yamaguchi, K.
82-000128
Yamaguchi, Y.
82-001271
Yamamori, K.
82-001915
82-002310
82-002418
82-002839
Yamamoto, K.
82-002962
Yamamoto, S.
82-000326
Yamamoto, Y.
82-000205
Yamane, S.
82-002368
Yamashita, I. S.
82-000232
Yamazoe, Y.
82-000173
Yancey, P. H.
82-000634
Yanez-Arancibia, A.
82-002191
82-002208
82-002209
82-002450
82-002451
82-002452
82-002574
82-002613
82-002616
82-002657
82-003006
Yanez-Arancibia, L. A.
82-002658
82-003007
Yang, J.
82-001739
Yano, I.
82-002247
Yano, K.
82-002200
Yant, P. R.
82-002992
Yap, Y. S.
82-002575
Yarzhombek, A. A.
82-002369
Yasuno, M.
82-000419
82-002836
Yatomi, H.
82-000185
82-002088
Yauk, J. C.
82-002228
Ydenberg, R. C.
82-000269

## AUTHOR INDEX

Yoakim, E. G.
82-000631
Yoder, C. O.
82-001112
Yohannan, T. M.
82-002453
82-002611
Yone, Y.
82-000696
82-001414
82-002080
82-002081
82-002083
Yoneda, M.
82-000369
82-000372
Yonemori, T.
82-000828
82-000829
Yoon, T.-H.
82-000755
Yoshida, H.
82-000755
Yoshida, T.
82-001146
Yoshimizu, M.
82-000368
Yoshinaka, R.
82-000756
82-000757
82-001492
82-002097
Yoshioka, T.
82-000080
Yoshiyama, R. M.
82-000206
82-000943
Yoshizaki, K.
82-000081
Youakim, S.
82-001869
Youger, J. D.
82-000578
Young, B. F.
82-001740
Young, C.
82-000327
Young, G.
82-000619
82-001437
82-001521
82-002210
82-002286
Young, P. C.
82-002370
Youngs, W. D.
82-001243
Youngson, A.
82-002371
Youngson, A. F.
82-000891
Youson, J. H.
82-000091
82-000594
82-000758
82-000759
82-002135
82-002207
82-002211
82-002212
82-002260
Yu, D. P.
82-000396
82-000404
82-000415
82-000416
Yu, K. K.
82-002749
Yunfei, W.
82-001719
Yurkowski, M.
82-000554
Yuuki, Y.
82-002513
Zabik, M. E.
82-001885
Zabik, M. J.
82-001885
Zaccone, G.
82-001522
Zadunaisky, J. A.
82-000660
Zakitis, L. H.
82-001150
Zalesna, G.
82-002363
Zalewski, M.
82-002058
82-002596
Zama, K.
82-000635
82-001392
Zamora, S.
82-000131
82-000728
Zandbergen, M. A.
82-001433
Zanuy, S.
82-001311
Zaugg, W. S.
82-000760
Zdinak, A.
82-002549
Zdor, V. I.
82-002369
Zelenkov, V. M.
82-002514
Zenkevich, G. A.
82-002059

# AUTHOR INDEX

...CONTINUED...
Zhukevich, G. A.
  82-002372
Zhurba, K. E.
  82-000622
Zubelio, D. J., Jr.
  82-002419
Zigareva, N. N.
  82-002156
Zhilinskiy, V. N.
  82-000157
Zhuravel', V. N.
  82-000102
Ziegler, S.
  82-003039
Zietse, M. A.
  82-001089
Zikic, R.
  82-000057
Zimmer, M. A.
  82-001904
Zimmerman, E. G.
  82-000177
  82-000798
Zimmermann, F.
  82-001979
Zinck, M. E.
  82-001888
Zinn, L. L.
  82-002228
Zinov'yev, Ye. A.
  82-000341
Zitko, V.
  82-002118
Zlotnitskiy, A. P.
  82-000005
Zlotov, O. G.
  82-002213
Zerlein, G.
  82-001338
  82-002454

## GEOGRAPHICAL INDEX

Adriatic Sea
82-002022
Africa
82-000333
Africa, Southern
82-001758
Africa: Kenya: Lake Victoria
82-002008
Africa: Lake Kariba
82-001743
Africa: Lake Malawi
82-002700
Africa: Lake Tanganyika
82-003037
Africa: Lake Victoria
82-000840
82-000899
82-002562
Alabama
82-000980
82-001226
82-001862
82-002113
Alabama: Apalachicola Drainage
82-000786
Alabama: Clay Cty.: Barbaree Ck.
82-000215
Alabama: Lake Guntersville
82-002051
Alabama: Lewis Smith Reservoir
82-001178
Alabama: Mobile Bay: Mississippi Sound
82-003002
Alabama: West Point Reservoir
82-000936
Alaska
82-000328
82-000516
82-000517
82-000948
82-001280
82-001525
82-002967
Alaska: Beaufort Sea
82-001591
Alaska: Bristol Bay
82-001971
Alaska: Bristol Bay: Kvichak River
82-000228
Alaska: Excursion Inlet
82-001619
Alaska: Gulf of Alaska
82-001635
Alaska: Karluk
82-000928
Alaska: Toolik Lake
82-000867
Antarctic Peninsula
82-000964
Arabian Sea
82-000223
82-001840
82-002203
Argentina
82-000242
82-000243
82-000495
82-001762
82-002470
82-002483
82-003020
Argentina: Salto Grande Reservoir
82-000490
Arizona
82-000882
82-001158
82-001162
82-001784
Arizona: Aravaipa Creek
82-002566
Arizona: Bill Williams Drainage
82-002631
82-002632
Arizona: Hassayampa Drainage
82-002632
Arizona: Santa Cruz Cty.
82-001718
Arizona: Virgin River
82-000988
Arizona: Yavapai Cty.
82-000327
Arkansas
82-000507
82-000976
82-001181
82-001187
82-001716
82-002624
Arkansas: Mississippi River
82-001704
Arkansas: Mud Creek
82-002519
Arkansas: Saline River
82-002647
Asia, Southeastern
82-000513
82-001768
Atlantic Ocean
82-000303
82-000397
82-000623
82-001006
82-001266
82-001649
82-001685
82-002019
82-002715
Atlantic Ocean, East Central
82-002024

# GEOGRAPHICAL INDEX

Atlantic Ocean, Eastern Tropical
82-002703
Atlantic Ocean, North
82-000212
82-000259
82-000261
82-000304
82-000458
82-000781
82-000855
82-000856
82-000860
82-000864
82-000869
82-000871
82-000873
82-000895
82-000896
82-000955
82-000977
82-000982
82-001038
82-001052
82-001607
82-001658
82-001668
82-001701
82-001739
82-001997
82-002030
82-002147
82-002190
82-002428
82-002438
82-002467
82-002467
82-002471
82-002475
82-002482
82-002518
82-002522
82-002533
82-002544
82-002587
82-002652
82-002724
82-002926
82-003014
82-003016
82-003021
Atlantic Ocean, North: Middle Atlantic Bight
82-000894
Atlantic Ocean, North: Saint Paul's Rocks
82-000965
Atlantic Ocean, South
82-000998
82-002642
82-002710
Atlantic Ocean, Southwestern
82-00274[illegible]
Atlantic Ocean, Tropical
82-000072
Atlantic Ocean, West Central
82-002582
82-002651
Atlantic Ocean: Scotian Shelf
82-002415
Australia
82-000307
82-001078
82-001692
82-001696
82-002680
Australia: Great Australian Bight
82-000316
82-002655
Australia: Great Barrier Reef
82-002028
Australia: Moreton Bay
82-000898
82-002437
Australia: New South Wales
82-000930
82-001085
82-001995
Australia: Queensland
82-000320
Australia: Western Australia
82-002628
82-002924
Australia: Western Australia: Swan-
River System
82-000286
Baffin Bay
82-001550
82-001600
Bahama Islands
82-000178
82-000816
Baltic Sea
82-000870
82-000929
82-003014
Banda Sea
82-001018
Barents Sea
82-000977
82-001015
Beaufort Sea
82-001591
Belize
82-001012
Bering Sea
82-001729
82-001970
82-003010
Bermuda
82-000340

## GEOGRAPHICAL INDEX

ck Sea
82-002442
neo
82-000361
82-001769
82-002692
swana
82-001202
82-001125
zil: La Plata Basin
82-001760
zil
82-000386
82-001853
zil: Amazon Basin
82-002705
lifornia
82-000096
82-000206
82-000244
82-000499
82-000822
82-000943
82-001244
82-001245
82-001282
82-001645
82-002036
82-002381
82-002720
82-002897
lifornia: Death Valley
82-001030
lifornia: El Capitan Reservoir
82-001175
lifornia: Fresno Cty.: Dinkey Creek
82-001247
lifornia: Golden Gate Natl. Rec. Area
82-001606
lifornia: Humboldt Cty.: Mad River
82-002719
lifornia: Imperial Cty.: Senator Wash
eservoir
82-000842
lifornia: Los Angeles
82-002810
lifornia: Millerton Lake
82-000886
lifornia: Monterey Bay: Elkhorn Slough
82-001261
lifornia: Napa Cty.: Lake Hennessey
82-002938
lifornia: Orange Cty.
82-001050
lifornia: Sacramento-San Joaquin
stuary
82-001676
82-001774
lifornia: Sacramento-San Joaquin System
82-002639
California: San Francisco Bay
82-001725
California: Santa Clara Drainage
82-001523
California: Stampede Reservoir
82-002556
Canada
82-000234
82-000843
82-001183
82-001595
82-001749
82-002520
Canada, Western
82-001184
Canada: Alberta: Sheep River
82-001880
Canada: Atlantic Ocean
82-002715
Canada: Baffin Bay
82-000588
Canada: Bay of Fundy
82-000585
Canada: British Columbia
82-000186
82-000193
82-000313
82-000318
82-000321
82-000322
82-000476
82-000854
82-000993
82-001248
82-001252
82-001720
82-002031
82-002708
82-002756
Canada: British Columbia: Barkley Sound
82-000222
Canada: British Columbia: Bella Coola River Estuary
82-000493
Canada: British Columbia: Carnation Creek
82-001637
Canada: British Columbia: Fraser River Estuary
82-000839
Canada: British Columbia: Kootenay Lake
82-000040
Canada: British Columbia: Marion Lake
82-000917
Canada: Gulf of St. Lawrence
82-002447
82-002482
82-002536
82-003011
Canada: Hudson Bay
82-002430

## GEOGRAPHICAL INDEX

Canada: James Bay
82-000314
82-002430
Canada: Labrador: Churchill River
82-001955
Canada: Manitoba: Brokenhead River
82-001670
Canada: Maritime Provinces
82-001253
Canada: New Brunswick
82-000229
82-002440
82-002482
82-002563
Canada: New Brunswick: Miramichi River
82-002474
Canada: Newfoundland
82-000962
82-001057
82-001066
82-001658
82-001860
82-002968
Canada: Northwest Territories
82-001179
Canada: Northwest Territories: Baffin Bay
82-001550
82-001600
Canada: Nova Scotia
82-000293
82-002415
82-002627
82-002663
Canada: Nova Scotia: Bay of Fundy
82-002546
Canada: Nova Scotia: Scotian Shelf
82-000895
82-001038
Canada: Nova Scotia: Sheet Harbor
82-000875
Canada: Nova Scotia: Westfield River
82-002794
Canada: Ontario
82-000381
82-000413
82-001194
82-001199
82-001858
82-002117
82-002435
Canada: Ontario: Algonquin Park
82-001351
Canada: Ontario: Bruce Peninsula
82-000308
Canada: Ontario: George Lake
82-000483
82-002796
Canada: Ontario: Lake Opinicon
82-000336
Canada: Ontario: Laurel Creek
82-000373
Canada: Ontario: Manitoulin Island
82-002626
Canada: Ontario: Normandale Creek
82-002459
Canada: Ontario: Ottawa River
82-000393
82-002603
82-002813
Canada: Quebec
82-000991
82-002427
82-002757
Canada: Quebec: lac Saint-Louis
82-001077
Canada: Quebec: Moisie River
82-000460
Canada: Quebec: Riviere aux Pins
82-000862
82-000950
Canada: Saskatchewan
82-001101
Canada: Scotian Shelf
82-002724
Canada: Yukon
82-000575
Caribbean Area
82-001755
Caroline Islands: Palau
82-001703
Caspian Sea
82-001019
82-002523
Central America
82-001013
Chile
82-000323
China
82-000530
82-001842
China: Hainan Island
82-001857
China: Xizang
82-001719
Colorado
82-000448
Colorado River
82-001249
Colorado: Arkansas River
82-002814
82-002815
Colorado: Coal Creek
82-002811
Colorado: Colorado River System
82-001024
Colorado: Fryingpan River
82-002925
Colorado: Lake Cty.: Turquoise Lake
82-002996

# GEOGRAPHICAL INDEX

**Colorado: Mesa Cty.**
82-001710
**Colorado: South Clear Creek**
82-002930
**Colorado: South Platte River**
82-002925
**Colorado: Tenmile Creek**
82-001953
**Colorado: Twin Lakes**
82-000452
82-000484
82-001350
82-001954
82-001959
82-002115
**Colorado: White River**
82-001273
**Colorado: Yampa River**
82-001273
**Columbia River**
82-000159
82-000827
82-001170
82-001948
82-002139
**Columbia River: John Day Reservoir**
82-000285
**Costa Rica**
82-000957
82-001270
82-001751
**Cuba: Laguna del Tesoro**
82-002725
**Czechoslovakia**
82-000220
82-002891
**Czechoslovakia: Danube River**
82-002988
**Dead Sea Valley**
82-001759
**Delaware**
82-001182
82-002441
**Delaware River Estuary**
82-002617
**Denmark**
82-000966
82-002469
**District of Columbia: Potomac River**
82-001251
**Easter Island**
82-002658
**Egypt: Lake Quarun**
82-002007
82-002978
**El Salvador: Jiquilisco Bay**
82-000979
82-001722
**England**
82-000290

...CONTINUED...
**England**
82-000378
82-000379
82-000783
82-000997
82-001825
82-001879
82-002114
82-002787
**England: Dorset: River Frome**
82-000926
**England: Northumberland: River Blyth**
82-001707
**England: River Trent**
82-000221
**England: Rutland Water**
82-000584
82-000938
82-001083
82-001200
**England: Severn Estuary**
82-001634
**England: Thames Estuary**
82-001609
82-002817
**England: Windermere**
82-001228
82-001616
**Europe, Central**
82-002780
**Fiji Islands**
82-000325
**Finland**
82-000409
82-000855
82-000856
82-000860
82-000869
82-000871
82-000873
82-001087
82-001240
82-002471
82-002475
**Finland: Gulf of Finland**
82-002522
82-002544
**Finland: Helsinki Sea**
82-003013
**Finland: Lake Konnevesi**
82-001242
**Finland: Lake Paijanne**
82-000902
**Finland: Lake Suomunjarvi**
82-001622
**Florida**
82-000257
82-000302
82-000315

# GEOGRAPHICAL INDEX

...CONTINUED...
Florida
82-000454
82-000731
82-000892
82-000904
82-001235
82-001608
82-001656
82-001788
82-002515
82-002625
82-003003
Florida: Apalachicola River
82-000209
82-002656
Florida: Dade Cty.
82-000268
Florida: India River Lagoon
82-000848
Florida: Indian River Cty.
82-001956
Florida: Lake Baldwin
82-000001
France
82-000295
82-000370
82-000648
France: Rhone River
82-000319
Gabon
82-000360
Georgia: Lake Oconee
82-002465
Georgia: West Point Reservoir
82-000581
82-000936
Ghana
82-002534
Great Lakes
82-000406
82-000785
82-000830
82-000837
82-000863
82-000961
82-001229
82-001231
82-001236
82-001735
82-001876
82-002426
82-002795
82-002982
Greece
82-001687
Guam
82-000992
Gulf of Mexico
82-000301
...CONTINUED...
Gulf of Mexico
82-000310
82-000315
82-000859
82-001685
82-001714
82-002619
82-002621
Hawaii
82-000202
82-000494
82-000614
82-001620
82-001775
82-002026
Hispaniola
82-002188
Hong Kong
82-002821
Idaho
82-002636
Idaho: Summit Creek
82-002989
Illinois
82-001642
82-002907
Illinois: Iroquois River
82-002420
Illinois: Lake Shelbyville
82-001966
Illinois: Pulaski Cty.: Mill Creek
82-000832
India
82-002457
82-002503
82-002508
82-002559
82-002560
82-002583
82-002611
82-002683
82-002768
82-002917
82-002921
82-003009
82-003015
82-003017
India: Behar
82-002069
India: Blangad
82-002920
India: Bombay
82-002634
India: Calicut
82-002507
82-002599
82-002605
India: Cuddalore
82-002916

## GEOGRAPHICAL INDEX

**India: Garhwal**
82-000903
**India: Goa**
82-002923
**India: Jammu Province**
82-002630
**India: Kashmir: Dal Lake**
82-002505
**India: Kawar**
82-002635
**India: Lake Nainital**
82-002793
**India: Mangalore**
82-002063
82-002453
**India: Minicoy Island**
82-002577
**India: Neenakara**
82-002919
**India: Porto Novo**
82-002422
**India: Pulicat Lake**
82-002065
82-002591
**India: Punjab**
82-002629
**India: Vellar Estuary**
82-003019
**India: Veraval**
82-002918
**India: Vizhinjam**
82-002446
**Indian Ocean**
82-000210
82-000273
82-000280
82-000281
82-000305
82-000311
82-001001
82-001765
82-002023
82-002123
82-002376
82-002439
82-002446
82-002457
82-002488
82-002489
82-002500
82-002503
82-002539
82-002540
82-002553
82-002581
82-002594
82-002614
82-002615
82-002634
...CONTINUED...
**Indian Ocean**
82-002640
82-002643
82-002650
82-002691
82-002698
82-002916
82-002918
82-002919
82-002920
82-002923
82-003012
82-003017
82-003018
**Indian Ocean: Bay of Bengal**
82-001990
**Indiana: Allen Cty.: Black Creek**
82-001747
**Indiana: Monroe Reservoir**
82-000944
**Indiana: St. Joseph River**
82-000974
**Inidana: Posey Cty.**
82-000972
**Iowa**
82-001051
**Iowa: Mississippi River: Pool 9**
82-001987
**Iowa: Polk Cty.: Big Breek Lake**
82-002928
**Iran**
82-000339
82-001003
**Iraq: Habbaniyah Reservoir**
82-000846
**Ireland**
82-000783
**Israel**
82-000534
82-001281
82-001848
82-002055
82-002070
82-002071
82-002580
**Israel: Lake Kinneret**
82-000908
82-002648
**Italy**
82-000002
**Italy: River Po**
82-000395
**Ivory Coast**
82-001308
82-002018
**Japan**
82-000023
82-000207
82-000255

...CONTINUED...
Japan
  82-000474
  82-000510
  82-000921
  82-001631
  82-001742
  82-002407
  82-002466
  82-002513
  82-002529
Japan Sea
  82-001596
Japan: Hokkaido
  82-001598
  82-002408
Japan: Hokkaido: Lake Notoro
  82-000838
Japan: Lake Biwa
  82-002910
Japan: Lake Kasumigaura
  82-001224
Japan: Lake Kuttara
  82-000498
Japan: Miyake-jima
  82-000890
Japan: Mt. Tsukuba
  82-000419
Japan: Odawa Bay
  82-000804
Japan: River Yura
  82-000251
Japan: Ryukyu Islands
  82-002645
Japan: Sagami Bay
  82-001639
Japan: Shin Tone River
  82-000872
Japan: Suruga Bay
  82-002200
Java
  82-001724
Jordan
  82-001759
Kansas
  82-000624
  82-000770
  82-000975
  82-002618
  82-002994
Kentucky
  82-001246
  82-001605
  82-001736
  82-002386
  82-002622
  82-002948
Kentucky: Barkley Lake
  82-001389
Kentucky: Barren River
  82-002521
Kentucky: Cave Run Lake
  82-002998
Kentucky: Kentucky Lake
  82-001389
Kentucky: Laurel River Lake
  82-003000
Kentucky: Oldham Cty.: Harrods Cre
  82-001781
Kenya
  82-001216
Kenya: Uaso Ngiro
  82-001705
Kuwait
  82-001840
  82-002425
Lake Erie
  82-000922
  82-001343
  82-002116
  82-002914
  82-002965
  82-002983
Lake Huron
  82-000767
  82-001611
  82-001618
  82-001885
Lake Malawi
  82-000840
Lake Michigan
  82-000282
  82-000579
  82-000777
  82-001108
  82-001218
  82-001230
  82-001873
  82-002394
  82-002423
  82-002490
  82-002511
  82-002662
  82-002790
Lake Ontario
  82-002684
Lake Superior
  82-000769
  82-000775
  82-001232
  82-001693
  82-002009
  82-002010
  82-002468
Lake Tanganyika
  82-003037
Lake Victoria
  82-000840
  82-000899
Louisiana
  82-000859

.CONTINUED...
uisiana
  82-002455
  82-002528
  82-002896
  82-002940
uisiana: Barataria Basin
  82-001210
uisiana: Grand Isle
  82-002687
uisiana: Lake Pontchartrain
  82-002899
uisiana: Vermilion Bay
  82-000455
uisiana: Wilkinson Cty.: Thompson Creek
  82-000969
ine
  82-000003
  82-000457
  82-001221
  82-001968
  82-002478
ine: Gulf of Maine
  82-000304
  82-000913
ine: Sheepscot River Estuary
  82-000983
ine: Sullivan Harbor
  82-000984
ine: Washington Cty.: Tomah Lake
  82-002463
lawi
  82-002653
lawi: Lake Malawi
  82-002694
  82-002707
laysia
  82-000363
laysia: Selangor
  82-002638
laysia: Subang Reservior
  82-002575
ryland: Allegany Cty.: Town Creek
  82-000967
ryland: North Branch Potomac River
  82-001096
diterranean Sea
  82-000927
  82-001687
  82-001848
  82-002025
  82-002701
xico
  82-000582
  82-001002
  82-002450
  82-002451
  82-002574
  82-002657
  82-002674

...CONTINUED...
Mexico
  82-003007
Mexico, Northwestern
  82-001196
Mexico: Camecuaro Lake
  82-002588
Mexico: Campeche: Terminos Lagoon
  82-002452
  82-002613
  82-002623
Mexico: Chiapas
  82-000347
Mexico: Chihuahua
  82-002675
Mexico: Coahuila: Cuatro Cienegas Basin
  82-001176
Mexico: Cuatro Cienegas
  82-000612
Mexico: Sinaloa: Huizache-Caimanero Lagoon
  82-002612
Mexico: Terminos Lagoon
  82-002616
Mexico: Vicente Guerrero Reservoir
  82-000833
Michigan
  82-000182
  82-001735
  82-002751
  82-002777
Michigan: Huron River
  82-002984
Michigan: Ingham Cty.: Red Cedar River
  82-001786
Michigan: Kalkaska Cty.: Manistee Lake
  82-002942
Michigan: Washtenaw Cty.: Fleming Ck.
  82-002992
Minnesota
  82-001721
Minnesota: Valley Creek
  82-000874
Mississippi
  82-000535
  82-002141
  82-002589
Mississippi River
  82-001212
  82-001704
  82-002955
Mississippi: Mississippi Sound
  82-002538
Missouri
  82-000976
Missouri River
  82-001996
  82-002987
Missouri River: Gavins Point Dam
  82-000845

# GEOGRAPHICAL INDEX

Missouri; Lake Taneycomo
    82-001186
Mongolian People's Republic
    82-001770
Montana
    82-001540
    82-002481
Montana: Flathead River
    82-002985
Montana: Sixteenmile Creek
    82-002822
Mozambique
    82-000305
Natural History
  Foods/Feeding
    82-002563
Nebraska
    82-001534
    82-001610
    82-002454
    82-002902
Nebraska: Jefferson Cty.: Buckley Creek Reservoir
    82-001678
    82-002016
Nebraska: Keith Cty.
    82-001602
Nebraska: Lake McConaughy
    82-001584
    82-002111
Nebraska: Missouri River
    82-001996
Nebraska: Niobrara River
    82-002986
Nebraska: Norden Reservoir
    82-000491
Nepal
    82-001727
Netherlands
    82-000400
Netherlands Antilles
    82-000978
Nevada
    82-000577
    82-000959
    82-000999
Nevada: Pyramid Lake
    82-000852
    82-001233
    82-002654
Nevada: Railroad Valley
    82-000985
Nevada: Smith Creek Canyon
    82-002637
Nevada: Virgin River
    82-000844
    82-000988
Nevada: Walker Lake
    82-002485
New Caledonia
    82-001753
New England
    82-001253
New Guinea Island
    82-001752
New Hampshire
    82-001785
New Mexico
    82-001002
    82-001784
    82-002906
New Mexico: Bitter Lake Wildl. Refuge
    82-000878
New Mexico: Tularosa Basin
    82-000866
New York
    82-001283
    82-001949
    82-002438
New York: Adirondacks
    82-001203
New York: Bronx River
    82-002443
    82-002444
New York: Calder Lake
    82-002981
New York: Cayuga Lake
    82-001873
New York: Dryden Lake
    82-002460
New York: Hudson River
    82-001621
    82-001740
New York: Hudson River Estuary
    82-000405
New York: Jefferson Cty.: Butterfield Lake
    82-001694
New York: Lake Erie
    82-002983
New York: Long Island
    82-001307
New York: St. Lawrence River
    82-001661
    82-002927
New Zealand
    82-000246
    82-000263
    82-000307
    82-000487
    82-002641
New Zealand: Glenariffe Stream
    82-001617
New Zealand: Lake Waahi
    82-000850
Nicaragua
    82-000957
    82-001603

# GEOGRAPHICAL INDEX

Nicaragua: Lake Nicaragua
82-002011
Nigeria
82-002019
82-002064
Nigeria: Lake Kainji
82-003038
North America
82-000514
North Carolina
82-000456
82-000960
82-000981
82-000982
82-001265
82-001662
82-001726
82-002602
North Carolina: Eno River
82-000841
North Carolina: Lake Norman
82-000377
North Carolina: Stokes Cty.: Belews Lake
82-000399
North Carolina: Tar River
82-000841
North Carolina: Waccamaw River
82-001728
North Dakota
82-001034
82-001717
North Dakota, North Central
82-001734
North Dakota, Northeastern
82-001708
North Dakota, Northwestern
82-001733
North Dakota, South Central
82-001732
North Dakota, Southeastern
82-001731
North Sea
82-001739
82-002147
Norway
82-000953
82-001864
82-002587
82-002590
82-002652
82-002769
82-002915
Norway: Lake Arungen
82-000270
Norway: Lake Langvatn
82-002552
82-002963
Norway: Vangsvatnet Lake
82-002424

...CONTINUED...
Norway: Vangsvatnet Lake
82-002496
Ohio
82-000578
82-001112
82-001589
82-002067
82-002751
Ohio River
82-002067
Ohio: Little Miami River
82-001111
Ohio: Maumee River
82-000849
Ohio: Paint Creek Lake
82-002945
Ohio: Richland Cty.: Cedar Fork Creek
82-000592
Oklahoma
82-001716
Oklahoma: American Horse Lake
82-000935
Oklahoma: Broken Bow Dam
82-000451
Oklahoma: Keystone Reservoir
82-001256
82-002517
Oklahoma: Lake Texoma
82-001657
Oklahoma: Mayes Cty.: Grand River
82-000309
Oklahoma: Mountain Fork River
82-000451
Oklahoma: Okmulgee Cty.: Dripping Springs Lake
82-001260
Oklahoma: Payne Cty.: Boomer Lake
82-000897
Oman
82-000835
Oregon
82-000218
82-000911
82-001284
82-001654
82-001960
82-002036
82-002381
82-002592
82-002943
Oregon: Harney Cty.: Borax Lake
82-001151
Oregon: Whitehorse Basin
82-001152
Oregon: Yaquina Bay
82-000792
Pacific Ocean
82-000214
82-000218

# GEOGRAPHICAL INDEX

...CONTINUED...
**Pacific Ocean**
82-000226
82-000231
82-000232
82-000234
82-000242
82-000243
82-000244
82-000272
82-000276
82-000283
82-000284
82-000294
82-000300
82-000313
82-000316
82-000318
82-000321
82-000322
82-000326
82-000332
82-000346
82-000375
82-000495
82-000499
82-000614
82-000822
82-000854
82-000911
82-000943
82-000993
82-001013
82-001017
82-001078
82-001183
82-001268
82-001596
82-001624
82-001654
82-001696
82-001724
82-001749
82-001754
82-001762
82-001763
82-001764
82-001766
82-002027
82-002031
82-002033
82-002034
82-002036
82-002381
82-002520
82-002526
82-002592
82-002628
82-002657
82-002672

...CONTINUED...
**Pacific Ocean**
82-002697
82-002723
82-002897
82-003010
**Pacific Ocean, Northwestern**
82-002649
**Pacific Ocean: Great Australian Bight**
82-002655
**Pacific Ocean: Great Barrier Reef**
82-002028
**Pacific Ocean: Palau**
82-000900
**Panama**
82-000887
82-001660
**Panama: Lake Bayano**
82-002317
**Papua New Guinea**
82-000300
82-002501
82-002524
82-002600
**Pennsylvania**
82-001099
**Pennsylvania: Bedford Cty.: Town Cree**
82-000967
**Peru**
82-000272
82-002461
82-002462
**Peru: Puyango-Tumbes River**
82-002013
**Philippines**
82-000317
82-001295
82-002068
82-002676
82-002755
82-002783
**Poland**
82-000289
82-000297
82-002596
**Poland: Lake Warniak**
82-001615
**Poland: Musov Reservoir**
82-000489
**Poland: Paproteckie Lake**
82-001646
**Potomac River**
82-001250
**Potomac River Estuary**
82-000931
82-000933
82-001220
82-001263
**Puerto Rico**
82-000227

# GEOGRAPHICAL INDEX

...CONTINUED...
Puerto Rico
  82-002784
Red Sea
  82-000951
  82-001020
Rhode Island
  82-000397
Sargasso Sea
  82-000213
Scandinavia
  82-000780
Scotland
  82-000212
  82-001992
Scotland: Firth of Clyde
  82-002431
Scotland: Forth Area
  82-000973
Scotland: Loch Leven
  82-001674
Scotland: Loch Voil
  82-000262
Shetland Islands
  82-001607
South Africa
  82-001275
  82-001715
  82-001886
  82-002679
  82-003004
South Africa: Gamtoos Estuary
  82-001713
South Africa: Holgat Estuary
  82-001712
South Africa: Kosi
  82-001702
South Africa: Kruger Natl. Park
  82-001723
South Africa: Natal
  82-001706
South Africa: Olifants River
  82-001023
South Africa: Uilkraals Estuary
  82-001711
South America
  82-000888
South Carolina
  82-000963
  82-001628
  82-001662
  82-001701
  82-001726
  82-002568
  82-002602
  82-002665
South Carolina: Cherokee Cty.:
  Ninety-Nine Islands Impoundment
  82-000374
South Carolina: Cooper River
  82-000949
South Carolina: Oconee Cty.: Howard Creek
  82-000211
South Carolina: Santee River
  82-001737
South Carolina: Waccamaw River
  82-001728
South Dakota
  82-002997
Spain
  82-001009
Spain: Catalan
  82-000927
Sri Lanka
  82-001166
Sudan
  82-001593
Surinam
  82-001772
Sweden: River Broalven Estuary
  82-002569
Tahiti
  82-000343
Taiwan
  82-001604
Tanzania
  82-001304
Tennessee
  82-000956
  82-001599
  82-001730
  82-001787
Tennessee: Bedford Cty.: Wartrace Creek
  82-002434
Tennessee: Center Hill Reservoir
  82-001683
Tennessee: Cordell Hull Reservoir
  82-001594
  82-001681
Tennessee: Holston River
  82-001738
Tennessee: Mississippi River
  82-001704
Tennessee: Smith Cty.: Brush Creek
  82-002433
  82-002434
Texas
  82-000315
  82-000647
  82-001002
  82-001254
  82-001303
  82-001690
  82-001709
  82-001891
  82-001951
Texas: Brazos Cty.: Little Brazos River
  82-001068
Texas: Galveston
  82-000968

## GEOGRAPHICAL INDEX

Texas: Galveston Bay
82-001092
Texas: Lake Conroe
82-002006
Texas: Lake Texoma
00-000000
Texas: Salt Creek
82-000878
Tonga Islands
82-000284
Turkey
82-001863
U.S. Virgin Islands
82-002502
United Kingdom
82-000781
82-001841
United Kingdon
82-003021
United States
82-000582
82-000778
82-001043
United States, Northwestern
82-000986
United States, Southeastern
82-000467
United States, Southwestern
82-001174
82-001249
82-002877
United States, Western
82-000469
United States: New England
82-000463
USSR
82-000288
82-000298
82-000337
82-000342
82-000462
82-000497
82-000762
82-002448
82-002472
82-002606
USSR: Amur Basin
82-002498
USSR: Estonia: Lake Vortsjarv
82-001238
USSR: Kamchatka River
82-002129
USSR: Kola Peninsula
82-002711
USSR: Kuybyshev Reservoir
82-000331
USSR: Lake Baikal
82-002337
Utah
82-000577

...CONTINUED...
Utah
82-000906
Utah: Colorado River
82-001029
Utah: Spawn Creek
82-002516
Utah: Virgin River
82-000844
82-000988
Utah: White River
82-000312
Venezuela: Lake Maracaibo
82-001805
Virgin Islands
82-000472
Virginia: Bottom Creek
82-001652
Virginia: Chincoteague Bay
82-000277
Virginia: Claytor Lake
82-001259
82-002017
82-002432
82-002550
Virginia: Giles Cty.: Big Stony Creek
82-001195
82-001197
82-001201
Virginia: Shenandoah River
82-000971
Wales
82-000901
Washington
82-000993
82-001185
82-001944
82-002036
82-002381
82-002894
Washington: Columbia River
82-002139
Washington: Puget Sound
82-002904
82-002912
Washington: Seattle
82-000414
West Germany: Danube River
82-000324
West Germany: Schleswig-Holstein
82-000970
West Indies
82-000391
West Virginia
82-002067
West Virginia: Mineral Cty.
82-000225
West Virginia: New Creek Lake
82-000488
West Virginia: North Branch Potomac Riv
82-001096

## GEOGRAPHICAL INDEX

...CONTINUED...
West Virginia: North Branch Potomac River
82-001100
Wisconsin
82-002750
82-002751
82-002752
82-002959
Wisconsin: Escanaba Lake
82-001746
Wisconsin: Lake Winnebago
82-002449
Wisconsin: Mississipp River: Lake Onalaska
82-002922
Wisconsin: Murphy Flowage
82-002929
Wisconsin: Nebish Lake
82-002667
Wisconsin: Wapaca Cty.: Emmons Creek
82-001958
Wisconsin: Wisconsin River
82-002789
Wyoming
82-000831
82-002686
82-002893
Wyoming: Lake DeSmet
82-002980
Wyoming: Little Brooklyn Lake
82-002005
Wyoming: North Platte River
82-000576
Wyoming: Yellowstone Natl. Park: Firehole River
82-001528
Yugoslavia: Lake Ohrid
82-000233
Yugoslavia: Topla River
82-002633

# SYSTEMATIC INDEX

Abrama bramis
  Cadmium
    82-002787
  Heavy Metals
    82-002787
  Lead
    82-002787
  Zinc
    82-002787
Abramis brama
  Age/Growth
    82-000289
    82-000290
  Amino Acids
    82-000157
  Condition Factors
    82-000289
  Digestive System
    82-000117
  Eggs
    82-000157
  Enzymes
    82-000117
  Hermaphroditism
    82-000734
  Hybridization
    82-000781
  Life History/General
    82-003013
  Lipid Composition
    82-000157
  Management/Research--Marine
    82-003013
  Mortality Rates
    82-000289
  Parasites/Diseases
    82-001808
  Protozoan Diseases
    82-001808
  Temperature
    82-000700
  Trichodina
    82-001808
  Year Class Strength
    82-000290
Abramis farenus
  Heavy Metals
    82-000409
  Mercury
    82-000409
Acanthocepola limbata
  Distribution/Geographical
    82-002635
Acanthopagrus australis
  Age/Growth
    82-002437
  Movements
    82-000898
  Parasites/Diseases
    82-001085
...CONTINUED...
Acanthopagrus australis
  Spawning
    82-002437
Acanthopagrus cuvieri
  Foods/Feeding
    82-002425
  Length-Weight Relationships
    82-002425
  Spawning
    82-002425
Acanthopagrus latus
  Foods/Feeding
    82-002425
  Length-Weight Relationships
    82-002425
  Spawning
    82-002425
Acanthopagrus schlegeli
  Variation Studies
    82-001544
    82-001545
Acerina cernua
  Light
    82-000088
  Reproduction
    82-000088
  Temperature
    82-000088
Acheilognathus lanceolatus
  Pheromones
    82-000879
  Spawning
    82-000879
Acipenser
  Age/Growth
    82-001698
Acipenser baeri
  Culture/Propagation
    82-000462
  Karyotypes
    82-000171
  Stocking/Introductions
    82-000462
Acipenser brevirostrum
  Distribution/Geographical
    82-002617
Acipenser guldenstadti
  Culture/Propagation
    82-002059
  Distribution/Vertical
    82-002523
  Endocrinology
    82-002372
  Hormones
    82-002372
  Induced Maturation
    82-002059
  Magnesium
    82-000133

...CONTINUED...
Acipenser guldenstadti
  Movements
    82-002523
  Osmoregulation
    82-000133
Acipenser oxyrhynchus desotoi
  Distribution/Geographical
    82-002656
Acipenser ruthenus
  Maturation
    82-000146
  Reservoir Release Effects
    82-000146
Acipenser stellatus
  Age/Length Composition
    82-000245
    82-002472
  Amino Acids
    82-000083
  Endocrinology
    82-002372
  Hormones
    82-000103
    82-002372
  Induced Maturation
    82-002220
  Maturation
    82-000245
    82-002220
  Population Studies
    82-002472
Acipenser transmontanus
  Variation Studies
    82-002139
Acipenseridae
  Respiration
    82-002296
  Vision
    82-002414
Aequidens coeruleopunctatus
  Brooding Behavior
    82-000876
  Spawning
    82-000876
Aequidens paraguayensis
  Brooding Behavior
    82-002491
Agosia chrysogaster
  Foods/Feeding
    82-002566
  Spawning
    82-000882
Alburnoides bipunctatus ohridanus
  Life History/General
    82-000233
  Population Studies
    82-000233
Aldrichetta forsteri
  Age/Growth
    82-000286

...CONTINUED...
Aldrichetta forsteri
  Movements
    82-000286
  Titanium Plant Effluents
    82-001867
Alepisaurus
  Meristic Studies
    82-000050
  Variation Studies
    82-000050
Alepisaurus ferox
  Musculature
    82-000080
Allocyttus verrucosus
  Age/Growth
    82-002593
Allosmerus elongatus
  Distribution/Geographical
    82-000313
Alopias superciliosus
  Life History/General
    82-000834
  Taxonomy
    82-000834
Alopias vulpinus
  Fins
    82-002132
Alos apseudoharengus
  Population Studies
    82-000488
Alosa
  Light
    82-000809
  Phototropism
    82-000809
Alosa aestivalis
  Distribution/Seasonal
    82-000261
  Insecticides
    82-002802
  Kepone
    82-002802
Alosa caspia caspia
  Age/Growth
    82-002606
  Maturation
    82-002606
Alosa pseudoharengus
  Abundance/Factors of
    82-002662
  Distribution/Factors of
    82-002432
  Distribution/Seasonal
    82-000261
  Foods/Feeding/Selectivity
    82-002550
  Forage Introductions
    82-000488
    82-001259

## SYSTEMATIC INDEX

...CONTINUED...

- Alosa pseudoharengus
  - Impingement/Entrainment
    - 82-001218
  - Insecticides
    - 82-002802
  - Kepone
    - 82-002802
  - Life History/General
    - 82-002432
  - Management/Research--Ponds
    - 82-000488
  - Population Studies
    - 82-001611
  - Power Plants
    - 82-001218
  - Predator/Prey Relationships
    - 82-000282
  - Temperature
    - 82-001440
    - 82-001461
  - Upwelling
    - 82-002662
- Alosa sapidissima
  - Insecticides
    - 82-002802
  - Kepone
    - 82-002802
- Ambloplites cavifrons
  - Age/Growth
    - 82-000841
  - Foods/Feeding
    - 82-000841
  - Taxonomy
    - 82-002673
- Ambloplites rupestris
  - Acid Precipitation
    - 82-000413
  - Age/Growth
    - 82-000413
  - Lernaea cruciata
    - 82-001077
  - Parasites/Diseases
    - 82-001077
  - Parasitic Copepods
    - 82-001077
- Amia calva
  - Age/Growth
    - 82-001694
  - Embryology
    - 82-000613
- Ammocrypta beani
  - Chemoreception
    - 82-001581
  - Fright Behavior
    - 82-001581
- Amphelikturus
  - New Species
    - 82-002681
  - Taxonomy
    - 82-002681
- Amphipnous cuchia
  - Solar Eclipses
    - 82-000814
- Amphiprion ocellaris
  - Nitrate
    - 82-002834
- Amphiprion percula
  - Predator/Prey Relationships
    - 82-000939
- Amphistichus argenteus
  - Skeletal System
    - 82-002175
- Amyzon gosiutensis
  - New Species
    - 82-002686
  - Paleontology
    - 82-002686
- Anabas testudineus
  - Insecticides
    - 82-002823
  - Lindane
    - 82-002823
  - Solar Eclipses
    - 82-000814
  - Spawning
    - 82-000238
- Anableps anableps
  - Reproductive System
    - 82-000051
- Anableps dowi
  - Reproductive System
    - 82-000051
- Anchoa mitchilli
  - Impingement/Entrainment
    - 82-001092
  - Power Plants
    - 82-001092
  - Thermal Pollution
    - 82-001092
- Anchoa parva
  - Skeletal System
    - 82-002209
- Ancistrus chagresi
  - Air Breathing
    - 82-000671
- Anguilla
  - Age/Growth
    - 82-001680
  - Anoxia
    - 82-002267
  - Biological Indicators
    - 82-002788
  - Cardio-Vascular System
    - 82-000656
    - 82-002267
  - Catecholamines
    - 82-000656
  - Culture/Propagation
    - 82-000027

## SYSTEMATIC INDEX

...CONTINUED...
- Anguilla
  - Distribution/Geographical
    - 82-000213
  - Distribution/Vertical
    - 82-000213
  - Heavy Metals
    - 82-002788
  - Hormones
    - 82-002267
  - Immune Response
    - 82-001053
  - Induced Maturation
    - 82-000027
  - Life History/General
    - 82-000213
  - Locomotion
    - 82-001517
  - Mercury
    - 82-002788
  - Movements
    - 82-000263
  - Myxobolus
    - 82-001053
  - Nervous System
    - 82-001517
  - Parasites/Diseases
    - 82-001053
  - Protozoan Diseases
    - 82-001053
  - Spawning
    - 82-000213
- Anguilla anguilla
  - Acanthocephala
    - 82-002771
  - Acanthocephalus clavula
    - 82-002771
  - Activity Patterns
    - 82-000824
  - Age/Growth
    - 82-000287
    - 82-000648
  - Ammonia
    - 82-000438
  - Biomagnification
    - 82-002805
  - Blood Chemistry
    - 82-001449
  - Cauliflower Disease
    - 82-001035
  - Coloration
    - 82-002184
  - Culture/Propagation
    - 82-000438
    - 82-000529
  - Dermocystidium
    - 82-001821
  - Fish Grading
    - 82-000529
  - Fungal Diseases
    - 82-002736

...CONTINUED...
- Anguilla anguilla
  - Heavy Metals
    - 82-002791
    - 82-002805
    - 82-002825
  - Hypothalamic-Hypophyseal System
    - 82-001450
  - Integument
    - 82-002184
  - IPN
    - 82-001825
  - Light
    - 82-000824
  - Maturation
    - 82-002329
    - 82-002330
  - Metamorphosis
    - 82-000648
  - Musculature
    - 82-000600
    - 82-002329
  - Olfaction
    - 82-000815
  - Organochlorines
    - 82-002792
  - Parasites/Diseases
    - 82-001035
    - 82-001821
    - 82-001825
    - 82-001845
    - 82-001854
    - 82-002736
    - 82-002771
  - Pineal Body
    - 82-000628
  - Protein Synthesis
    - 82-000109
  - Protozoan Diseases
    - 82-001821
  - Radionuclides
    - 82-002825
  - Saprolegnia
    - 82-002736
  - Sphaerostoma bramae
    - 82-001854
  - Spring Ulcer Disease
    - 82-001845
  - Stress
    - 82-001449
  - Temperature
    - 82-000109
  - Trematodes
    - 82-001854
  - Ulcers
    - 82-001845
  - Viral Diseases
    - 82-001825
  - Vision
    - 82-002145

...CONTINUED...
Anguilla anguilla
  Vision
    82-002330
  Zinc
    82-002825
Anguilla australis schmidtii
  Parasites/Diseases
    82-001079
  Telogaster opisthorchis
    82-001079
  Trematodes
    82-001079
Anguilla japonica
  Ammonia
    82-001942
  Bacterial Diseases
    82-000366
    82-000371
  Corpuscle of Stannius
    82-001471
  Edwardsiella tarda
    82-000366
  Flexibacter columnaris
    82-000371
  Parasites/Diseases
    82-000366
    82-000371
    82-002739
  Protozoan Diseases
    82-002739
  Trichodina
    82-002739
Anguilla rostrata
  Age/Growth
    82-000949
  Blood Chemistry
    82-000098
  Distribution/Geographical
    82-001738
  Distribution/Seasonal
    82-002528
  Eustrongylides tubifex
    82-002759
  Insecticides
    82-002852
  Kepone
    82-002852
  Life History/General
    82-002879
  Lipid Composition
    82-000139
  Lipid Content
    82-000139
  Management/Research--General
    82-002879
  Nematodes
    82-002759
  Oil
    82-001129

...CONTINUED...
Anguilla rostrata
  Olfaction
    82-002345
  Parasites/Diseases
    82-002759
  Sex Ratios
    82-000949
Anisotremus moricandi
  Distribution/Geographical
    82-002668
  Ecology
    82-002668
  Taxonomy
    82-002668
Anomalops katoptron
  Deretrema philippinensis
    82-002755
  Parasites/Diseases
    82-002755
  Trematodes
    82-002755
  Vision
    82-002173
Anoplarchus purpurescens
  Foods/Feeding
    82-000943
    82-001645
Anoplarchus purpurescens purpurescens
  Habitat Selection
    82-000792
Anoplopoma fimbria
  Age/Growth
    82-000945
  Bioenegetics
    82-002351
  Movements
    82-001635
Anthias aurulentus
  New Species
    82-001766
Anthias nicholsi
  Distribution/Geographical
    82-002627
Anthias olivaceus
  New Species
    82-001766
Apeltes quadracus
  Ecology
    82-000045
  Life History/General
    82-002421
  Meristic Studies
    82-000045
  Reproduction
    82-002421
  Spawning
    82-002421
Aphanius
  Speciation
    82-002713

# SYSTEMATIC INDEX

...CONTINUED...

- Aphanius
  - Taxonomy
    - 82-002713
- Aphanius dispar
  - Life History/General
    - 82-000835
- Aphyosemion gardneri
  - Spawning
    - 82-000248
- Apistogramma commbrae
  - Taxonomy
    - 82-001760
- Aploactinidae
  - Taxonomy
    - 82-002704
- Aplocheilus lineatus
  - Acoustico-Lateralis System
    - 82-000642
  - Foods/Feeding
    - 82-000918
    - 82-000919
  - Predator/Prey Relationships
    - 82-000919
- Aplodinotus grunniens
  - Age/Growth
    - 82-000849
    - 82-000952
  - Distribution/Geographical
    - 82-000975
  - Mortality Rates
    - 82-000849
  - Transportation
    - 82-000567
- Archomenidia
  - Taxonomy
    - 82-000338
- Archomenidia marvelae
  - New Species
    - 82-002674
- Archoplites interruptus
  - Foods/Feeding
    - 82-000996
  - Life History/General
    - 82-000852
  - Predator/Prey Relationships
    - 82-000996
- Argentina silus
  - Life History/General
    - 82-001607
- Aristichthys nobilis
  - Culture/Propagation
    - 82-000536
    - 82-000574
  - Distribution/Geographical
    - 82-002624
  - Electrophoresis
    - 82-002331
  - Gamete Storage
    - 82-000574

...CONTINUED...

- Aristichthys nobilis
  - Induced Maturation
    - 82-000536
  - Nutrition
    - 82-000032
  - Status
    - 82-002624
- Arius caelatus
  - Albinism
    - 82-002185
- Arius felis
  - Auditory Senses
    - 82-000823
- Arripis trutta
  - Foods/Feeding
    - 82-001692
  - Harvest
    - 82-002924
  - Population Studies
    - 82-001692
- Aspius vorax
  - Life History/General
    - 82-000846
- Astatotilapia flaviijosephi
  - Aggressive Behavior
    - 82-002399
  - Coloration
    - 82-002399
- Astronesthidae
  - Distribution/Geographical
    - 82-002649
- Astronotus ocellatus
  - Temperature
    - 82-000731
- Astyanax bimaculatus lacustris
  - Reproductive System
    - 82-002305
- Atherinomorus stipes
  - Skeletal System
    - 82-002191
- Atoxolepis
  - Distribution/Geographical
    - 82-002615
- Austrophycis
  - Taxonomy
    - 82-001025
- Bagrus docmac
  - Exploitation Rates
    - 82-002008
  - Mortality Rates
    - 82-002008
- Barbus
  - Spawning
    - 82-002497
- Barbus barbus bocagei
  - Myxobolus tauricus
    - 82-001807
  - Parasites/Diseases
    - 82-001807

...CONTINUED...
- Barbus barbus bocagei
  - Protozoan Diseases
    - 82-001807
- Barbus conchonius
  - Carbamates
    - 82-000434
  - Insecticides
    - 82-000434
  - Temik
    - 82-000434
- Barbus foerschi
  - New Species
    - 82-002692
- Barbus meridionalis
  - Electrophoresis
    - 82-000170
  - Variation Studies
    - 82-000170
- Barbus trevelyani
  - Culture/Propagation
    - 82-002061
  - Induced Maturation
    - 82-002061
- Belonesox belizanus
  - Temperature
    - 82-000731
- Beloniformes
  - Acoustico-Lateralis System
    - 82-001377
  - Taxonomy
    - 82-001377
- Benthophilus ctenolepidus pinchuki
  - New Subspecies
    - 82-001019
- Benthophilus nagistri lencorancius
  - New Subspecies
    - 82-001019
- Benthosema glaciale
  - Meristic Studies
    - 82-000591
  - Variation Studies
    - 82-000591
- Benthosema pterota
  - Early Development
    - 82-002203
- Beryx splendens
  - Age/Growth
    - 82-002582
- Betta splendens
  - Learning
    - 82-000819
  - Memory
    - 82-000819
  - Spawning
    - 82-001625
- Bhanotia fasciolata
  - Taxonomy
    - 82-001007
- Blennius pholis
  - Air Breathing
    - 82-001447

...CONTINUED...
- Blennius pholis
  - Haemogregarina bigemina
    - 82-002738
  - Hematozoa
    - 82-002738
  - Parasites/Diseases
    - 82-002738
  - Protozoan Diseases
    - 82-002738
  - Respiration
    - 82-001447
- Blennius ponticus
  - Taxonomy
    - 82-000334
- Blicca bjoerkna
  - Hybridization
    - 82-000781
- Bodianus prognathus
  - New Species
    - 82-000346
- Boleophthalmus boddarti
  - Territorial Behavior
    - 82-000801
- Boreogadus saida
  - Habitat Selection
    - 82-001550
  - Life History/General
    - 82-001591
    - 82-001600
- Brachydanio
  - Enzymes
    - 82-000675
- Brachydanio nigrofasciatus
  - Alcohol Dehydrogenase
    - 82-000101
- Brachydanio rerio
  - Abnormalities
    - 82-002178
  - Alarm Reaction
    - 82-000825
  - Embryology
    - 82-000597
    - 82-000676
    - 82-001442
    - 82-002161
  - Gamete Storage
    - 82-002107
  - Heavy Metals
    - 82-000432
  - IPN
    - 82-001824
  - Lead
    - 82-000432
  - Musculature
    - 82-002176
  - Parasites/Diseases
    - 82-001824
  - Predator/Prey Relationships
    - 82-000432

...CONTINUED...
Brachydanio rerio
  Skeletal System
    82-002178
  Viral Diseases
    82-001824
  Vision
    82-000596
    82-000800
Brama japonica
  Distribution/Geographical
    82-000326
  Distribution/Seasonal
    82-000326
  Karyotypes
    82-001546
Bramidae
  Commerical Fishing
    82-002921
  Harvest
    82-002921
Branchiostegidae
  Musculature
    82-001014
  Taxonomy
    82-001014
Breviraja
  Morphology
    82-001374
  Taxonomy
    82-001374
  Variation Studies
    82-001374
Brevoortia
  Nets/Netting
    82-000471
  Purse Seines
    82-000471
Brevoortia patronus
  Abundance
    82-000859
  Commercial Fishing
    82-000859
  Lernaeenicus radiatus
    82-002770
  Marking/Tagging
    82-000461
  Parasites/Diseases
    82-002770
  Parasitic Copepods
    82-002770
  Population Studies
    82-000859
Brevoortia tyrannus
  Acoustico-Lateralis System
    82-000610
  Culture/Propagation
    82-000540
  Digestion Rates
    82-000664

...CONTINUED...
Brevoortia tyrannus
  Excretory System
    82-000664
  Holding Facilities
    82-000540
  Research Test Fish
    82-000540
  Swimbladder
    82-000610
Brycon melanopterus
  Ergasilus
    82-001859
  Gill Parasites
    82-001859
  Parasites/Diseases
    82-001859
  Parasitic Copepods
    82-001859
Butis butis
  Distribution/Geographical
    82-000325
Bythitidae
  Distribution/Geographical
    82-000303
Calamoichthys
  Taxonomy
    82-001026
Calamoichthys calabaricus
  Air Breathing
    82-001489
  Respiration
    82-001489
Callionymus
  Taxonomy
    82-001011
Campostoma anomalum
  Acid Mine Water
    82-001099
  Distribution/Geographical
    82-001595
  Life History/General
    82-001595
  Status
    82-001595
Carangidae
  Culture/Propagation
    82-000185
  Orientation/Homing
    82-000185
  Population Studies
    82-001620
  Predator/Prey Relationships
    82-000281
Caranx hippos caninus
  Parasites/Diseases
    82-002758
    82-002758
  Protomicrocotyle nayaritensis
    82-002758

...CONTINUED...

- Caranx hippos caninus
  - Trematodes
    - 82-002758
- Carassius auratus
  - Air Breathing
    - 82-002230
  - Anoxia
    - 82-000147
    - 82-001513
    - 82-002359
  - Ascorbic Acid
    - 82-001933
  - ATP
    - 82-000687
  - Auditory Senses
    - 82-000666
    - 82-001558
    - 82-002396
  - Blood Chemistry
    - 82-000687
    - 82-000727
  - Calcium
    - 82-002368
  - Chemoreception
    - 82-001566
  - Communication
    - 82-001572
    - 82-002412
  - Culture/Propagation
    - 82-000566
  - Distribution/Geographical
    - 82-000981
  - Endocrinology
    - 82-001438
    - 82-002323
  - Enzymes
    - 82-000142
    - 82-000724
    - 82-001406
    - 82-001419
    - 82-001513
    - 82-001514
    - 82-002274
  - Heavy Metals
    - 82-001933
  - Hormones
    - 82-002323
  - Immune Response
    - 82-000724
  - Induced Maturation
    - 82-000111
  - Insecticides
    - 82-001935
  - Learning
    - 82-002419
  - Light
    - 82-000704
  - Mercury
    - 82-001933

...CONTINUED...

- Carassius auratus
  - Metabolic Rates
    - 82-000140
  - Metabolism
    - 82-000155
  - Musculature
    - 82-001488
  - Nervous System
    - 82-001557
    - 82-002169
    - 82-002322
  - Nitrogen
    - 82-000155
  - Nitrogen Metabolism
    - 82-001514
    - 82-001515
  - Olfaction
    - 82-001572
    - 82-002412
  - Osmoregulation
    - 82-000137
    - 82-000687
    - 82-001406
    - 82-001427
  - Oxygen
    - 82-001575
  - Pheromones
    - 82-001572
    - 82-002412
  - Phosphates
    - 82-000439
  - Phosphorus
    - 82-002368
  - Pigments
    - 82-002170
  - Pineal Body
    - 82-000704
  - Piscicides
    - 82-001935
  - Regeneration
    - 82-002322
  - Repiration
    - 82-002230
  - Reproduction
    - 82-000111
  - Scales
    - 82-000632
    - 82-000633
  - Startle Response
    - 82-001557
  - Temperature
    - 82-000114
    - 82-000140
    - 82-001427
    - 82-001566
    - 82-002274
  - Toxaphene
    - 82-001935
  - Transportation
    - 82-000566

...CONTINUED...
- Carassius auratus
  - Vision
    - 82-001467
- Carassius auratus gibelio
  - Age/Growth
    - 82-000288
  - Age/Length Composition
    - 82-000288
  - Distribution/Geographical
    - 82-002648
  - Osmoregulation
    - 82-000097
  - Scales
    - 82-000288
- Carassius carassius
  - Culture/Propagation
    - 82-000021
  - Induced maturation
    - 82-000021
  - Light
    - 82-000021
  - Temperature
    - 82-000021
  - Vision
    - 82-002157
    - 82-002158
- Carcharhinus
  - Distribution/Geographical
    - 82-000301
    - 82-000965
  - Life History/General
    - 82-001757
  - Population Studies
    - 82-000965
  - Taxonomy
    - 82-001757
- Carcharhinus brevipinna
  - Identification
    - 82-001750
- Carcharhinus leucas
  - Age/Growth
    - 82-000957
  - Cleaning Behavior
    - 82-000807
  - Exploitation Rates
    - 82-002011
  - Harvest
    - 82-002011
  - Life History/General
    - 82-000848
  - Management/Research--Lakes
    - 82-002011
  - Osmoregulation
    - 82-002317
  - Population Studies
    - 82-002011
- Carcharhinus limbatus
  - Identification
    - 82-001750
- Carcharhinus plumbeus
  - Foods/Feeding
    - 82-000277
  - Marking/Tagging
    - 82-002934
- Carcharhinus signatus
  - Dentition
    - 82-000623
  - Taxonomy
    - 82-000623
- Carcharodon carcharias
  - Activity Patterns
    - 82-001551
  - Foods/Feeding
    - 82-001551
  - Life History/General
    - 82-002438
  - Metabolic Rates
    - 82-001551
  - Temperature
    - 82-001551
- Catostomus commersoni
  - Acid Precipitation
    - 82-002796
  - Age/Growth
    - 82-000952
    - 82-002598
  - Aluminum
    - 82-001892
  - Biochemical Composition
    - 82-002796
  - Cnidospora
    - 82-000373
  - Heavy Metals
    - 82-001892
  - Lissorchis attenuatus
    - 82-001847
  - Lunar Influences
    - 82-001567
  - Nematodes
    - 82-001082
  - Parasites/Diseases
    - 82-000373
    - 82-001082
    - 82-001785
    - 82-001847
  - Pineal Body
    - 82-001439
    - 82-001568
  - Protozoan Diseases
    - 82-000373
  - Skeletal System
    - 82-002796
  - Temperature
    - 82-001439
    - 82-001567
    - 82-001568
  - Temperature Selection
    - 82-001439

...CONTINUED...
Catostomus commersoni
Temperature Selection
82-001567
82-001568
Trematodes
82-001847
Catostomus insignis
Foods/Feeding
82-002566
Catostomus macrocheilus x C. columbianus
Hybridization
82-000159
Catostomus plebeius
Variation Studies
82-001527
Catostomus santaanae
Population Studies
82-001523
Variation Studies
82-001523
Catostomus tahoensis
Age/Growth
82-000959
Competition
82-002556
Foods/Feeding
82-000959
82-002556
Metabolic Rates
82-002361
Temperature
82-002361
Catostomus warnerensis
Status
82-000858
Caulolatilus bermudensis
New Species
82-000340
Caulolatilus microps
Age/Growth
82-002602
Foods/Feeding
82-001662
Mortality Rates
82-002602
Caulophrynidae
Distribution/Geographical
82-001018
Taxonomy
82-001018
Cebidichthys violaceus
Digestive System
82-000096
Foods/Feeding
82-000096
82-001645
Centrarchidae
Age/Growth
82-001682

...CONTINUED...
Centrarchidae
Culture/Propagation
82-001294
Hybridization
82-001294
Predator/Prey Relationships
82-001682
Centropomus undecimalis
Bacterial Diseases
82-001805
Early Development
82-002165
Lymphocystis
82-001805
Parasites/Diseases
82-001805
Centropristis striata
Management/Research--Marine
82-003016
Mortality Rates
82-003016
Centropyge
Spawning
82-000239
Centropyge bispinosus
Hybridization
82-001538
Centropyge shepardi
Hybridization
82-001538
Cephaloscyllium
Blood Chemistry
82-002229
Cepola rubescens
Blood Chemistry
82-000644
Respiration
82-000644
Cetorhinus maximus
Distribution/Geographical
82-002652
Chaenogobius
Taxonomy
82-000352
Chaenogobius castanea
Age/Growth
82-001598
Distribution/Geographical
82-001598
Spawning
82-001598
Chaetodon
Anilocra
82-000391
Competition
82-000816
Habitat Selection
82-000816
Parasites/Diseases
82-000391

## SYSTEMATIC INDEX

...CONTINUED...
- Chaetodon
  - Parasitic Isopods
    - 82-000391
- Chaetodon aculeatus
  - Spawning
    - 82-002502
- Chaetodon capistratus
  - Spawning
    - 82-002502
- Chalcalburnus chalcoides
  - Temperature
    - 82-000082
- Chalcalburnus tarichi
  - Agricultural Processing Effluents
    - 82-001863
- Chana marulius
  - Nematodes
    - 82-002768
  - Parasites/Diseases
    - 82-002768
  - Pingus sinensis
    - 82-002768
- Channa
  - Air Breathing
    - 82-000136
- Channa punctatus
  - Air Breathing
    - 82-000733
    - 82-002194
  - Blood Chemistry
    - 82-001456
  - Embryology
    - 82-002194
  - Endosulfan
    - 82-001926
  - Endrin
    - 82-002854
  - Insecticides
    - 82-001926
    - 82-002854
  - Organochlorines
    - 82-002854
  - Regeneration
    - 82-001456
  - Reproductive System
    - 82-000707
  - Respiration
    - 82-000733
  - Respiratory System
    - 82-002194
- Chanos chanos
  - Culture/Propagation
    - 82-001337
    - 82-002068
  - Gamete Storage
    - 82-001337
  - Lipid Composition
    - 82-001392
  - Pond Culture
    - 82-002068
- Characidae
  - Taxonomy
    - 82-002696
- Chasmodes bosquianus
  - Activity Patterns
    - 82-000195
  - Spawning
    - 82-001628
- Cheilotrema saturnum
  - Spawning
    - 82-000247
- Chelon labrosus
  - Ergenstrema labrosi
    - 82-000378
  - Foods/Feeding/Selectivity
    - 82-000912
  - Gill Parasites
    - 82-000378
  - Parasites/Diseases
    - 82-000378
    - 82-000379
  - Trematodes
    - 82-000378
    - 82-000379
- Chimaera monstrosa
  - Cardio-Vascular System
    - 82-002130
  - Excretory System
    - 82-002180
  - Histology
    - 82-002180
- Chondrichthyes
  - Distribution/Geographical
    - 82-001709
  - Fish Lists/Keys
    - 82-001709
  - Life History/General
    - 82-001269
  - Management/Research--Marine
    - 82-001269
- Chonerhinos
  - Taxonomy
    - 82-001768
- Chromis enchrysura
  - Taxonomy
    - 82-001010
  - Variation Studies
    - 82-001010
- Chromis multilineatus
  - Anilocra chromis
    - 82-002785
  - Parasites/Diseases
    - 82-002785
  - Parasitic Isopods
    - 82-002785
- Chromis punctipinnis
  - Temperature
    - 82-000822
  - Temperature Selection
    - 82-000822

...CONTINUED...

- Chrysichthys
  - Cage Culture
    - 82-001308
  - Culture/Propagation
    - 82-001308
- Chrysichthys nigrodigitatus
  - Culture/Propagation
    - 82-001314
  - Feeding Experiments
    - 82-001314
  - Feeds
    - 82-001314
- Chrysichthys walkeri
  - Culture/Propagation
    - 82-001292
  - Pond Culture
    - 82-001292
- Chrysophrys auratus
  - Parasites/Diseases
    - 82-001032
- Chrysophrys major
  - Culture/Propagation
    - 82-000549
  - Enzymes
    - 82-001414
  - Feeding Experiments
    - 82-000549
  - Feeds
    - 82-000549
  - Hormones
    - 82-001414
  - Nutrition
    - 82-002083
- Cichla
  - Taxonomy
    - 82-002709
- Cichlasoma
  - Aggressive Behavior
    - 82-002410
- Cichlasoma bimaculatum
  - Temperature
    - 82-000731
- Cichlasoma cyanoguttatum
  - Temperature
    - 82-000731
- Cichlasoma meeki
  - Temperature
    - 82-000731
- Cichlasoma nigrofasciatum
  - Abnormalities
    - 82-002206
  - Inbreeding
    - 82-002206
- Cichlasoma octofasciatum
  - Temperature
    - 82-000731
- Cichlasoma trimaculatum
  - Temperature
    - 82-000731
- Cichlidae
  - Age/Growth
    - 82-001686
  - Brooding Behavior
    - 82-001578
  - Chemoreception
    - 82-000791
  - Foods/Feeding
    - 82-002562
  - Variation Studies
    - 82-000612
- Cirrhilabrus temminckii
  - Early Development
    - 82-000076
- Cirrhina mrigala
  - Abnormalities
    - 82-002133
  - Endosulfan
    - 82-000441
  - Insecticides
    - 82-000441
  - Skeletal System
    - 82-002133
- Citharichthys cornutus
  - Early Development
    - 82-002204
- Citharichthys gymnorhinus
  - Early Development
    - 82-002204
- Citharichthys spilopterus
  - Early Development
    - 82-002204
- Clarias
  - Bibliographies
    - 82-002049
  - Life History/General
    - 82-002049
  - Taxonomy
    - 82-001771
- Clarias batrachus
  - Air Breathing
    - 82-001379
  - Calcium
    - 82-000742
  - Carbofuran
    - 82-001925
  - Early Development
    - 82-001379
  - Gas Bubble Disease
    - 82-001075
  - Parasites/Disease
    - 82-001075
  - Respiratory System
    - 82-001379
  - Temperature
    - 82-000731
  - Vitamins
    - 82-000742
- Clarias gariepinus
  - Culture/Propagation
    - 82-002084

## SYSTEMATIC INDEX

...CONTINUED...
- Clarias gariepinus
  - Feeding Experiments
    - 82-002084
  - Fish Kills
    - 82-001886
  - Salinity
    - 82-001886
- Clarias lazera
  - Age/Growth
    - 82-002580
  - Culture/Propagation
    - 82-000533
    - 82-002109
  - Feeding Experiments
    - 82-000533
  - Fingerling Production
    - 82-000533
  - Induced Maturation
    - 82-002109
  - Reproductive System
    - 82-002134
- Clevelandia ios
  - Burrowing Behavior
    - 82-001565
  - Commensalism
    - 82-001565
- Clinostomus elongatus
  - Distribution/Geographical
    - 82-001595
  - Life History/General
    - 82-001595
  - Status
    - 82-001595
- Clupea harengus
  - Age/Growth
    - 82-000860
  - Auditory Senses
    - 82-000175
    - 82-000176
  - Biomagnification
    - 82-002804
  - Chlordane
    - 82-002804
  - DDT
    - 82-002804
  - Foods/Feeding
    - 82-002544
  - Healing
    - 82-000681
  - Heavy Metals
    - 82-002808
  - Insecticides
    - 82-002804
  - Marking/Tagging
    - 82-001977
  - Mortality Rates
    - 82-000860
    - 82-000869
    - 82-002471

...CONTINUED...
- Clupea harengus
  - Organochlorines
    - 82-002804
  - Polychlorinated Biphenyls
    - 82-002804
  - Population Studies
    - 82-000856
    - 82-000860
    - 82-000869
    - 82-000871
    - 82-002471
    - 82-002475
  - Production
    - 82-000869
    - 82-002471
  - Recruitment
    - 82-000871
  - Startle Response
    - 82-000175
    - 82-000176
  - Wire Tags
    - 82-001977
- Clupea harengus harengus
  - Abundance/Factors of
    - 82-000864
  - Age/Growth
    - 82-000955
    - 82-001658
  - Electrophoresis
    - 82-000163
  - Fish Stocks
    - 82-000864
  - Foods/Feeding
    - 82-002536
    - 82-002547
  - Life History/General
    - 82-001609
  - Management/Research--Marine
    - 82-001609
  - Maturation
    - 82-000955
  - Meristic Studies
    - 82-000073
  - Population Studies
    - 82-000864
  - Predator/Prey Relationships
    - 82-002536
  - Trophic Relationships
    - 82-002536
  - Turbidity
    - 82-002547
  - Variation Studies
    - 82-000163
    - 82-000163
- Clupea harengus membras
  - Spawning
    - 82-002476
- Clupea harengus pallasi
  - Abundance/Factors of
    - 82-000881

...CONTINUED...
- Clupea harengus pallasi
  - Abundance/Factors of
    - 82-002664
  - Cannibalism
    - 82-000915
  - Electrophoresis
    - 82-000163
  - Fecundity
    - 82-000838
  - Fish Stocks
    - 82-002466
  - Foods/Feeding
    - 82-000838
    - 82-000915
    - 82-001601
    - 82-002664
  - Forecasting
    - 82-002031
  - Management/Research--Marine
    - 82-002031
  - Marking/Tagging
    - 82-001189
  - Mortality Factors
    - 82-002532
  - Mortality Rates
    - 82-002664
  - Movements
    - 82-002520
  - Orientation/Homing
    - 82-002520
  - Pheromones
    - 82-001601
  - Population Studies
    - 82-002977
  - Predator/Prey Relationships
    - 82-002532
  - Reproductive System
    - 82-002181
  - Spawning
    - 82-000838
    - 82-000881
    - 82-001601
  - Spawning Substrates
    - 82-000881
  - Variation Studies
    - 82-000163
    - 82-000163
- Clupeidae
  - Digestive System
    - 82-000703
  - Enzymes
    - 82-000703
    - 82-002218
  - Reproduction
    - 82-002218
- Clupeonella delicatula
  - Abundance/Factors of
    - 82-002664
  - Foods/Feeding
    - 82-002664

...CONTINUED...
- Clupeonella delicatula
  - Mortality Rates
    - 82-002664
  - Salinity
    - 82-000121
  - Sperm
    - 82-000121
- Clupeonella engrauliformis
  - Fishing Gear
    - 82-002956
- Cobitis taenia
  - Foods/Feeding
    - 82-000932
  - Mouth Parts
    - 82-000932
- Coelonotus argulus
  - Distribution/Geographical
    - 82-000325
- Coleotropis blackburni
  - Skeletal System
    - 82-002191
- Colisa fasciatus
  - Arsenic
    - 82-001929
  - Reproduction
    - 82-001477
  - Solar Eclipses
    - 82-000814
- Cololabis saira
  - Harvest
    - 82-002526
  - Movements
    - 82-002526
  - Temperature
    - 82-002526
- Comephoridae
  - Seismosensory System
    - 82-000075
- Coregonidae
  - Stocking/Introductions
    - 82-000468
- Coregoninae
  - Electrophoresis
    - 82-000785
  - Speciation
    - 82-000785
  - Variation Studies
    - 82-000785
- Coregonus albula
  - Biochemical Composition
    - 82-002246
  - Parasites/Diseases
    - 82-002718
  - Reproduction
    - 82-002246
- Coregonus artedii
  - Abundance
    - 82-001618
  - Harvest
    - 82-002009

...CONTINUED...
- Coregonus artedii
  - Life History/General
    - 82-002430
  - Management/Research--Lakes
    - 82-002009
  - Population Studies
    - 82-001618
    - 82-002009
- Coregonus autumnalis migratorius
  - Reproductive System
    - 82-002292
  - Sperm
    - 82-002292
- Coregonus clupeaformis
  - Abundance
    - 82-001618
  - Abundance/Factors of
    - 82-002423
  - Cestodes
    - 82-001067
  - Culture/Propagation
    - 82-000519
  - Electrophoresis
    - 82-000837
  - Exploitation Rates
    - 82-000224
    - 82-000865
    - 82-002966
  - Fingerling Production
    - 82-000519
  - Fish Stocks
    - 82-000615
    - 82-000767
    - 82-000837
  - Fishing Gear
    - 82-002958
  - Life History/General
    - 82-000837
    - 82-002423
    - 82-002430
  - Marking/Tagging
    - 82-002932
  - Meristic Studies
    - 82-000615
  - Organochlorines
    - 82-001874
  - Parasites/Diseases
    - 82-001067
  - Polychlorinated Biphenyls
    - 82-001873
  - Population Studies
    - 82-000224
    - 82-000767
    - 82-000865
    - 82-001618
    - 82-002966
  - Recruitment
    - 82-000865
  - Spawning
    - 82-000254

...CONTINUED...
- Coregonus clupeaformis
  - Spawning
    - 82-000865
  - Trapnets
    - 82-002958
  - Triaenophorus crassus
    - 82-001067
  - Variation Studies
    - 82-000767
    - 82-000837
  - Year Class Strength
    - 82-002423
- Coregonus fera
  - Age/Growth
    - 82-000306
  - Biochemical Composition
    - 82-000306
- Coregonus lavaretus
  - Culture/Propagation
    - 82-001324
  - Feeders
    - 82-001324
  - Movements
    - 82-002522
  - pH
    - 82-001916
  - Salinity
    - 82-000102
  - Xenobiotics
    - 82-001916
- Coregonus lavaretus pidschian
  - Age/Growth
    - 82-000298
  - Scales
    - 82-000298
- Coregonus peled
  - ATP
    - 82-002326
  - Blood Chemistry
    - 82-002326
  - pH
    - 82-002326
- Coregonus pollan
  - Biochemical Composition
    - 82-000655
  - Enzymes
    - 82-000654
  - Starvation
    - 82-000654
- Coregonus sardinella marisalbi
  - Salinity
    - 82-000102
- Coris dorsomaculata
  - Spawning
    - 82-000890
- Corphopterus nicholsi
  - Spawning
    - 82-002484
- Coryphaena equiselis
  - Life History/General
    - 82-001597

## SYSTEMATIC INDEX

...CONTINUED...

- Coryphaena equiselis
  - Mangement/Research--Marine
    - 82-001597
- Coryphaena hippurus
  - Life History/General
    - 82-001597
  - Locomotion
    - 82-000204
  - Management/Research--Marine
    - 82-001597
- Coryphaenoides holotrachys
  - Fecundity
    - 82-000250
- Coryphopterus personatus
  - Hermaphroditism
    - 82-000723
- Cosmocampus retropinnis
  - New Species
    - 82-002681
- Cottidae
  - Seismosensory System
    - 82-000075
- Cottus
  - Distribution/Factors of
    - 82-002397
  - Habitat Selection
    - 82-002397
- Cottus bairdi
  - Identification
    - 82-002684
  - Life History/General
    - 82-002441
  - Movements
    - 82-001636
  - Spawning
    - 82-002481
- Cottus beldingi
  - Foods/Feeding
    - 82-000923
  - Predator/Prey Relationships
    - 82-000923
- Cottus cognatus
  - Habitat Selection
    - 82-000867
  - Identification
    - 82-002684
  - Population Studies
    - 82-000867
  - Production
    - 82-000867
- Cottus gobio
  - Foods/Feeding
    - 82-002545
- Cottus gulosus
  - Competition
    - 82-002390
- Cottus rhotheus
  - Predator/Prey Relationships
    - 82-000266
- Crenimugil labrosus
  - Foods/Feeding
    - 82-001672
- Crystallodytes cookei
  - Early Development
    - 82-000614
  - Embryology
    - 82-000614
  - Movements
    - 82-000614
- Ctenogobius veliensis
  - New Species
    - 82-002683
- Ctenopharyngodon
  - Anatomy
    - 82-000344
  - Taxonomy
    - 82-000344
- Ctenopharyngodon idella
  - Aquatic Plant Control
    - 82-000001
    - 82-001296
    - 82-001542
    - 82-001593
    - 82-002050
  - Cage Culture
    - 82-000525
  - Culture/Propagation
    - 82-000525
    - 82-000536
    - 82-000574
    - 82-001296
    - 82-001542
    - 82-002105
  - Digestive System
    - 82-000151
  - Electrophoresis
    - 82-002331
  - Foods/Feeding
    - 82-000265
  - Gamete Storage
    - 82-000574
  - Induced Maturation
    - 82-000536
  - Life History/General
    - 82-001593
  - Monosex Culture
    - 82-001542
    - 82-002105
  - Sex Reversal
    - 82-001542
    - 82-002105
  - Spawning
    - 82-000884
    - 82-002498
- Ctenopharyngodon idella X Aristichthys nobilis
  - Age/Growth
    - 82-002549
  - Electrophoresis
    - 82-002383

...CONTINUED...
Ctenopharyngodon idella X
 Aristichthys nobilis
  Foods/Feeding
   82-002549
  Hybridization
   82-002383
   82-002549
Culaea inconstans
  Air Breathing
   82-000697
  Apatemon gracilis
   82-001070
  Parasites/Diseases
   82-001070
  Respiration
   82-000697
  Trematodes
   82-001070
Cyclocheilichthys apogon
  Foods/Feeding
   82-002575
Cyclopterus lumpus
  Carotenoids
   82-002314
Cydothone parapallida
  New Species
   82-000998
Cymatogaster aggregata
  Temperature
   82-000822
  Temperature Selection
   82-000822
Cynoglossus
  Age/Growth
   82-002605
Cynoglossus macrolepidotus
  Life History/General
   82-002439
Cynoglossus macrostomus
  Length-Weight Relationships
   82-002609
Cynoscion arenarius
  Metabolic Rates
   82-000747
  Movements
   82-000847
  Population Studies
   82-000847
  Spawning
   82-000847
  Temperature
   82-000747
Cynoscion nebulosus
  Foods/Feeding
   82-002538
  Metabolic Rates
   82-000747
  Swimming Performance
   82-001586
  Temperature
   82-000747
Cynoscion regalis
  Swimbladder
   82-002183
Cyprinidae
  Culture/Propagation
   82-001298
   82-002060
  Fingerling Production
   82-001298
  Fish Lists/Keys
   82-002638
  Fry Production
   82-001298
  Hatchery Design
   82-002060
  Incubators
   82-002060
  Mouth Parts
   82-002187
  Reproductive System
   82-000063
  Sperm
   82-002225
Cypriniformes
  Identification/Larvae
   82-001024
  Morphology
   82-001024
Cyprinodon
  Electrophoresis
   82-000345
   82-000788
  Salinity
   82-001030
  Sexual Dimorphism
   82-000608
  Speciation
   82-002713
  Taxonomy
   82-000345
   82-001030
   82-002713
  Temperature
   82-001030
  Variation Studies
   82-000345
   82-000788
Cyprinodon dearborni
  Salinity
   82-002238
Cyprinodon nevadensis nevadensis
  Acidification
   82-001908
  pH
   82-001908
Cyprinodon pecosensis
  Maturation
   82-000878
  Spawning
   82-000878

## SYSTEMATIC INDEX

...CONTINUED...
Cyprinodon pecosensis
Spawning
82-000883
Cyprinodon salinus
Salinity
82-000637
Cyprinodon tularosa
Age/Growth
82-000866
Fecundity
82-000866
Life History/General
82-000866
Population Studies
82-000866
Production
82-000866
Cyprinodon variegatus
Digestive System
82-000622
Industrial Wastes
82-000425
Insecticides
82-001910
Kepone
82-001910
Cyprinus carpio
Age/Growth
82-000528
82-001681
Amino Acids
82-000037
82-001487
82-002245
Anesthestics
82-001332
Anesthetics
82-002858
ATP
82-000635
Biochemical Composition
82-002309
Biomagnification
82-001146
Blood Chemistry
82-000085
82-000691
82-000692
82-002245
82-002281
82-002282
Cadmium
82-001128
Chemoreception
82-002406
Chromium
82-001127
Complexing Agents
82-001128

...CONTINUED...
Cyprinus carpio
Condition Factors
82-001681
Copper
82-002850
Culture/Propagation
82-000036
82-000526
82-000528
82-000531
82-000532
82-000536
82-000542
82-000555
82-000560
82-000562
82-000574
82-001287
82-001297
82-001310
82-001312
82-001313
82-001326
82-001332
82-002069
82-002072
82-002077
82-002078
82-002094
82-002098
Digestive System
82-001466
82-002369
Egg Collection
82-002069
Endocrinology
82-000690
82-002236
82-002240
82-002348
Enzymes
82-001406
82-001414
Excretory System
82-000630
82-002290
Feeding Experiments
82-000036
82-000037
82-000542
82-000555
82-000560
82-000562
82-001310
82-001312
82-001313
82-001326
82-002077
82-002078

...CONTINUED...
- Cyprinus carpio
  - Feeding Experiments
    - 82-002094
    - 82-002098
  - Feeds
    - 82-000036
    - 82-000542
    - 82-000555
    - 82-000560
    - 82-001310
    - 82-001312
    - 82-001326
    - 82-002077
    - 82-002094
    - 82-002098
  - Fin Rays
    - 82-000067
  - Foods/Feeding
    - 82-001667
    - 82-001672
  - Fry Production
    - 82-001297
  - Gamete Storage
    - 82-000574
  - Gas Bubble Disease
    - 82-000672
  - Gas Supersaturation
    - 82-000672
  - Genetic Strains
    - 82-000528
  - Growth Stimulants
    - 82-000531
    - 82-001287
  - Heated Water
    - 82-000542
  - Heavy Metals
    - 82-001127
    - 82-001128
    - 82-002850
  - Hormones
    - 82-000526
    - 82-000531
    - 82-001414
    - 82-002236
    - 82-002240
  - Hybridization
    - 82-002072
  - Hypoxia
    - 82-001394
  - Immune Response
    - 82-001498
  - Induced Maturation
    - 82-000526
    - 82-000536
  - Iodine
    - 82-002078
  - Laboratory Spawning
    - 82-001297
  - Larval Behavior
    - 82-002402

...CONTINUED...
- Cyprinus carpio
  - Light
    - 82-002402
  - Lipid Metabolism
    - 82-000562
  - Maturation
    - 82-002348
  - Metabolic Rates
    - 82-002290
  - Mouth Parts
    - 82-001667
  - MS-222
    - 82-002858
  - Musculature
    - 82-001487
  - Nervous System
    - 82-000122
    - 82-002169
  - Nutrition
    - 82-000562
    - 82-001313
    - 82-002078
    - 82-002083
  - Osmoregulation
    - 82-000674
    - 82-000678
    - 82-001406
  - Parasites/Diseases
    - 82-000672
  - Phototropism
    - 82-002402
  - Polychlorinated Biphenyls
    - 82-001885
  - Polyploidy
    - 82-000532
  - Pond Culture
    - 82-000528
  - Reproduction
    - 82-002348
  - Respiration
    - 82-001332
    - 82-001394
  - RNA
    - 82-001490
  - Scales
    - 82-000633
  - Steroids
    - 82-000526
    - 82-002240
    - 82-002304
  - Surfactants
    - 82-001146
  - Temperature
    - 82-001490
  - Transportation
    - 82-001332
  - Tubulin
    - 82-000122
  - Vision
    - 82-000143

...CONTINUED...
Cyprinus carpio
  Vision
    82-002153
Cyrtocara liemi
  New Species
    82-002700
Cytarichthys gilberti
  Nerocilia californica
    82-001062
  Parasites/Diseases
    82-001062
  Parasitic Isopods
    82-001062
Dactyloscopidae
  Fish Lists/Keys
    82-001006
  Taxonomy
    82-001006
Dallia asmirabilis
  New Species
    82-000337
Danio malabaricus
  Cadmium
    82-002855
  Copper
    82-002855
  Heavy Metals
    82-002855
  Mercury
    82-002855
Dascyllus
  Karyotypes
    82-001539
  Speciation
    82-001539
Dascyllus aruanus
  Coexistance
    82-000821
  Spawning
    82-001626
Dascyllus marginatus
  Coexistance
    82-000821
Dasyatidae
  Taxonomy
    82-002678
Dasyatis alcockii
  Foods/Feeding
    82-002540
Dasyatis centroura
  Spawning
    82-000257
Dasyatis imbricatus
  Maturation
    82-002489
  Reproduction
    82-002489
Dasyatis sabina
  Corneal Injuries
    82-000389

...CONTINUED...
Dasyatis sabina
  Parasites/Diseases
    82-000389
Dasyatis sephen
  Foods/Feeding
    82-002540
Dasyatis uarnak
  Foods/Feeding
    82-002540
Dicentrarchus labrax
  Abnormalities
    82-002073
  Culture/Propagation
    82-000546
    82-001311
    82-002073
  Feeding Experiments
    82-000546
    82-001311
  Feeds
    82-000546
  Starvation
    82-001311
Dicerobatis eregoodoo
  Harvest
    82-002918
Diplodus sargus
  Early Development
    82-001361
  Embryology
    82-001361
  Foods/Feeding
    82-001570
  Swimming Performance
    82-001570
Diplodus vulgaris
  Foods/Feeding
    82-001570
  Swimming Performance
    82-001570
Diplophos
  Musculature
    82-000603
  Skeletal System
    82-000603
  Taxonomy
    82-000603
Diplophos taenia
  Early Development
    82-002190
Diplospinus multistriatus
  Acoustico-Lateralis System
    82-002177
Dipnoa
  Dentition
    82-000624
  Paleontology
    82-C00624
Ditrema temmincki
  Competition
    82-000804

## SYSTEMATIC INDEX

...CONTINUED...
Ditrema temmincki
Habitat Selection
82-000804
Ditrema viridis
Competition
82-000804
Habitat Selection
82-000804
Dormitator latifrons
Foods/Feeding
82-002574
Trophic Relationships
82-002574
Dorosoma cepedianum
Age/Growth
82-001681
Condition Factors
82-001681
Foods/Feeding
82-000907
Karyotypes
82-000162
Dorosoma petenense
Forage Introductions
82-001175
Karyotypes
82-000162
Management/Research--Reservoirs
82-001175
Stocking/Introductions
82-001175
Doryichthys retzi
Distribution/Geographical
82-000325
Doryrhamphus
Taxonomy
82-001754
Draconetta gegonips
New Species
82-001764
Draconetta nana
New Species
82-001764
Draconetta striata
New Species
82-001764
Draconettidae
Fish List/Keys
82-001764
Ebinania macquariensis
New Species
82-001763
Ebinania malacocephala
New Species
82-001763
Echeneidae
Fish Lists/Keys
82-002641
Echeneis naucrates
Life History/General
82-000210
Eigenmannia
Electrolocation
82-000188
Elacatinus janssi
New Species
82-001751
Elasmobranchii
Age/Growth
82-000947
Eleotridae
Taxonomy
82-000342
Eleotriodes helsdingeni
Early Development
82-002509
Spawning
82-002509
Eleotris maltzani
Taxonomy
82-000348
Elops saurus
Vision
82-000055
Embiotoca jacksoni
Temperature
82-000822
Temperature Selection
82-000822
Embiotoca lateralis
Blood Chemistry
82-001429
82-002283
Embiotocidae
Parasites/Diseases
82-002723
Skeletal System
82-001375
Taxonomy
82-001375
Enchelybrotula
Distribution/Geographical
82-001004
Taxonomy
82-001004
Encyclogobius newberryi
Life History/General
82-001606
Engraulis anchoita
Population Studies
82-000243
Spawning
82-000243
Engraulis japonica
Distribution/Seasonal
82-001639
Engraulis mordax
Age/Growth
82-000294
82-000668

## SYSTEMATIC INDEX

...CONTINUED...

- Engraulis mordax
  - Age/Length Composition
    - 82-000226
    - 82-000232
  - Biomass
    - 82-000231
  - Mortality Rates
    - 82-000868
  - Population Studies
    - 82-000226
    - 82-000231
    - 82-000232
  - Predator/Prey Relationships
    - 82-000939
  - Remote Sensing
    - 82-000499
  - Spawning
    - 82-000499
  - Starvation
    - 82-000716
  - Year Class Strength
    - 82-000226
    - 82-000868
- Engraulis ringens
  - Distribution/Vertical
    - 82-002527
- Engraulus encrasicholus
  - Abundance/Factors of
    - 82-002664
  - Foods/Feeding
    - 82-002664
  - Mortality Rates
    - 82-002664
- Entoshenus japonicus
  - Collagen
    - 82-002294
- Epibulus insidiator
  - Movements
    - 82-000900
- Epinephelus morio
  - Parasites/Diseases
    - 82-002717
- Epinephelus salmoides
  - Cage Culture
    - 82-001306
  - Culture/Propagation
    - 82-001306
- Epinephelus tauvina
  - Foods/Feeding
    - 82-002425
  - Length-Weight Relationships
    - 82-002425
  - Spawning
    - 82-002425
- Eptatretus burgeri
  - Reproduction
    - 82-002504
  - Spawning
    - 82-002504
- Eptatretus caribbeaus
  - New Species
    - 82-001755
- Ericymba buccata
  - Abundance/Factors of
    - 82-001747
- Erpetoichthys
  - Taxonomy
    - 82-001026
- Esox americanus
  - Parasites/Diseases
    - 82-001788
- Esox lucius
  - Abundance/Factors of
    - 82-000991
  - Age/Growth
    - 82-000220
  - Biomagnification
    - 82-002804
  - Black-Spot Disease
    - 82-001071
  - Cadmium
    - 82-002787
  - Chlordane
    - 82-002804
  - Culture/Propagation
    - 82-001290
  - DDT
    - 82-002804
  - Distribution/Seasonal
    - 82-000893
  - Fingerling Production
    - 82-001290
  - Foods/Feeding
    - 82-000220
    - 82-000926
  - Heavy Metals
    - 82-000409
    - 82-002787
  - Insecticides
    - 82-002804
  - Lead
    - 82-002787
  - Life History/General
    - 82-000220
  - Management/Research--Rivers and Streams
    - 82-002927
  - Mercury
    - 82-000409
  - Metabolic Rates
    - 82-000659
  - Organochlorines
    - 82-002804
  - Parasites/Diseases
    - 82-001071
    - 82-001087
    - 82-001834
  - Polychlorinated Biphenyls
    - 82-002804

...CONTINUED...
Esox lucius
Pond Culture
82-001290
Population Studies
82-001615
Production
82-001290
Regulations
82-002927
Size Limits
82-002927
Spawning
82-000991
Temperature Selection
82-000893
Thermal Pollution
82-000893
Trematodes
82-001071
Tumors
82-001087
Viral Diseases
82-001834
Viral Hemorrhagic Septicemia
82-001834
Year Class Strength
82-000991
Zinc
82-002787
Esox masquinongy
Digestive System
82-002124
Distribution/Seasonal
82-000893
Early Development
82-002124
Harvest
82-002998
Management/Research--Reservoirs
82-002998
Population Studies
82-002998
Temperature Selection
82-000893
Thermal Pollution
82-000893
Esox niger
Age/Growth
82-002460
Biomass
82-002460
Management/Research--Lakes
82-002460
Mortality Rates
82-002460
Parasites/Diseases
82-001788
Population Studies
82-002460

...CONTINUED...
Esox niger
Regulations
82-002460
Size Limits
82-002460
Etelis
Taxonomy
82-000332
Etelis radiosus
New Species
82-000332
Etheostoma
Aethycteron
82-001858
Competition
82-002435
Foods/Feeding
82-002435
Habitat Selection
82-002435
Parasites/Diseases
82-001858
Trematodes
82-001858
Etheostoma atripinne
Distribution/Geographical
82-002622
Habitat Selection
82-002622
Etheostoma blennioides
Competition
82-001589
Foods/Feeding
82-001589
Habitat Selection
82-001589
Etheostoma caeruleum
Competition
82-001589
Foods/Feeding
82-001589
Habitat Selection
82-001589
Parasites/Diseases
82-001781
Etheostoma chlororbranchium
Distribution/Geographical
82-000981
Etheostoma collettei
Distribution/Geographical
82-001716
Etheostoma coosae
Life History/General
82-000215
Etheostoma cragini
Habitat Selection
82-000975
Etheostoma edwini
Life History/General
82-001608

## SYSTEMATIC INDEX

...CONTINUED...

- Etheostoma microperca
  - Life History/General
    - 82-002420
- Etheostoma olivaceum
  - Life History/General
    - 82-002434
- Etheostoma perlongum
  - Age/Growth
    - 82-002445
  - Life History/General
    - 82-002445
- Etheostoma simoterum
  - Life History/General
    - 82-002433
- Etheostoma spectabile
  - Mortality Factors
    - 82-001460
  - Temperature
    - 82-001460
- Etheostoma striatulum
  - Life History/General
    - 82-002434
- Etheostoma swaini
  - Chemoreception
    - 82-001581
  - Fright Behavior
    - 82-001581
- Etheostoma zonale
  - Competition
    - 82-001589
  - Foods/Feeding
    - 82-001589
  - Habitat Selection
    - 82-001589
- Etheostomatini
  - Electrophoresis
    - 82-000765
- Ethmalosa fimbriata
  - Foods/Feeding
    - 82-002534
- Etmopterus spinax
  - Enzymes
    - 82-001432
  - Leydig Organ
    - 82-001372
- Etroplus maculatus
  - Spawning
    - 82-000258
- Etroplus suratensis
  - Spawning
    - 82-000258
- Etropus crossotus
  - Early Development
    - 82-002204
- Eucinostomus melanopterus
  - Distribution/Geographical
    - 82-000315
- Eupomacentrus
  - Communication
    - 82-000174

...CONTINUED...

- Eupomacentrus
  - Sound Production
    - 82-000174
- Eupomacentrus acapulcoensis
  - Trophic Relationships
    - 82-002572
- Eupomacentrus planifrons
  - Territorial Behavior
    - 82-000198
- Eurypharynx pelecanoides
  - Cestodes
    - 82-002761
  - Parasites/Diseases
    - 82-002761
  - Pistana eurypharyngis
    - 82-002761
- Eusthenopteron foordi
  - Auditory Senses
    - 82-000627
- Evermannellidae
  - Distribution/Geographical
    - 82-002689
  - Taxonomy
    - 82-002689
- Exocoetidae
  - Abundance
    - 82-000236
  - Distribution/Geographical
    - 82-000311
- Exoglossum maxillingua
  - Aggressive Behavior
    - 82-002400
  - Eye-Picking
    - 82-002400
- Fistularia petimbra
  - Camouflage
    - 82-001564
  - Coloration
    - 82-001564
- Fistularia tabacaria
  - Distribution/Geographical
    - 82-001740
- Foerschichthys
  - Taxonomy
    - 82-002702
- Fugu niphobles
  - Toxins
    - 82-001459
    - 82-002310
- Fundulus
  - Culture/Propagation
    - 82-001333
  - Karyotypes
    - 82-000164
  - Sex Determination
    - 82-000164
- Fundulus grandis
  - Baitfish Culture
    - 82-001300

## SYSTEMATIC INDEX

...CONTINUED...
Fundulus grandis
  Baitfish Culture
    82-002076
  Culture/Propagation
    82-001300
    82-002076
  Eimeria funduli
    82-001055
  Heated Water
    82-002076
  Parasites/Diseases
    82-001055
  Protozoan Diseases
    82-001055
Fundulus heteroclitus
  Age/Growth
    82-001519
  Aroclor
    82-001148
  Blood Chemistry
    82-001400
  Copper
    82-002826
  Cortisol
    82-002300
  Eimeria funduli
    82-001819
    82-002742
  Endocrinology
    82-000636
    82-002297
    82-002300
  Exercise
    82-001400
  Food Conversion Efficiency
    82-001519
    82-001671
  Foods/Feeding
    82-001671
  Heavy Metals
    82-001934
    82-002826
    82-002864
  Immune Response
    82-001036
    82-001037
  Insecticides
    82-001148
  Lead
    82-002864
  Life History/General
    82-002443
  Malate Dehydrogenase
    82-000766
  Mercury
    82-001934
    82-002864
  Metabolic Rates
    82-000140

...CONTINUED...
Fundulus heteroclitus
  Osmoregulation
    82-000636
    82-002297
  Otoliths
    82-000629
  Parasites/Diseases
    82-001036
    82-001037
    82-001819
    82-002742
  Polychlorinated Biphenyls
    82-001148
  Protozoan Diseases
    82-001819
    82-002742
  Reproductive System
    82-001357
  Swimming Performance
    82-001400
  Temperature
    82-000140
Fundulus majalis
  Copper
    82-002826
  Fin Rays
    82-001363
  Heavy Metals
    82-002826
  Temperature
    82-001363
Fundulus notatus
  Distribution/Geographical
    82-001595
  Life History/General
    82-001595
  Status
    82-001595
Fundulus sciadicus
  Age/Growth
    82-001602
  Foods/Feeding
    82-001602
Furcodontichthys
  New Genus
    82-002705
Furcodontichthys novaesi
  New Species
    82-002705
Gadidae
  Enzymes
    82-000706
  Identification/Fry
    82-002714
Gadopsis marmoratus
  Blood Chemistry
    82-002251
    82-002252
Gadus
  Management/Research--Marine
    82-001997

## SYSTEMATIC INDEX

...CONTINUED...
Gadus
Population Studies
82-001997
Gadus macrocephalus
Age/Growth
82-002585
Gadus morhua
Age/Growth
82-002587
82-002590
Antifreeze Production
82-000106
82-002261
Aroclor
82-001906
Ascorbic Acid
82-000145
Bacterial Diseases
82-000367
82-002721
Biochemical Composition
82-001404
82-001405
Bioenergetics
82-002590
Blood Chemistry
82-000112
Digestion Rates
82-001453
Digestive System
82-001426
82-001451
Distribution/Geographical
82-000977
Fecundity
82-002482
Fin Rot
82-000367
Foods/Feeding
82-002533
82-002590
Heavy Metals
82-002808
Hormones
82-001426
Hypoxia
82-001479
Insecticides
82-001906
Locomotion
82-000179
Nervous System
82-001480
Nets/Netting
82-001982
Parasites/Diseases
82-000367
82-002715
82-002721

...CONTINUED...
Gadus morhua
Parasites/Diseases
82-002775
Polychlorinated Biphenyls
82-001906
Population Studies
82-000855
82-000873
Predator/Prey Relationships
82-002533
Protein Synthesis
82-002303
Reproduction
82-000145
Reproductive System
82-001405
Respiration
82-001479
Ulcers
82-002721
Vibrio anguillarum
82-002721
Viral Diseases
82-002721
X-cells
82-002775
Gaidropsaurus biscayensis
Early Development
82-002142
Gaidropsaurus mediterraneus
Early Development
82-002142
Galeichthys caerulescens
Life History/General
82-002450
Otoliths
82-002208
Galeocerdo cuvier
Activity Patterns
82-000202
Attacks on Humans
82-001573
Gambusia
Distribution/Geographical
82-001012
Taxonomy
82-001012
Gambusia affinis
Bird Predation
82-001647
Bothriocephalus acheilognathi
82-002767
Cestodes
82-002767
Escape Behavior
82-001548
Glugea
82-001050
Insecticides
82-001891
Light
82-000134

...CONTINUED...
Gambusia affinis
 Parasites/Diseases
  82-001050
  82-002767
 Predator/Prey Relationships
  82-001647
 Protozoan Diseases
  82-001050
 Reproduction
  82-000134
 Toxaphene
  82-001891
 Vision
  82-000699
Gambusia rhizophorae
 Distribution/Factors of
  82-002625
 Temperature
  82-002625
Garra tibanica ghorensis
 New Subspecies
  82-001759
Gasterosteus aculeatus
 Activity Patterns
  82-000941
 Age/Growth
  82-001673
  82-002576
  82-002596
 Bird Predation
  82-000990
 Cestodes
  82-001856
 Competition
  82-000990
 Cyathocephalus truncatus
  82-001856
 Distribution/Geographical
  82-002626
 Endocrinology
  82-001398
  82-002227
 Foods/Feeding
  82-000941
  82-002576
 Hormones
  82-002227
 Life History/General
  82-002421
 Parasites/Diseases
  82-001856
 Photoperiodism
  82-001387
 Polymorphism
  82-001530
 Population Studies
  82-002596
 Predator/Prey Relationships
  82-000990

...CONTINUED...
Gasterosteus aculeatus
 Reproduction
  82-001387
  82-002421
 Saccus Vasculosus
  82-001410
 Schistocephalus solidus
  82-001856
 Spawning
  82-001633
  82-002421
 Temperature
  82-001673
Gasterosteus wheatlandi
 Activity Patterns
  82-000941
 Foods/Feeding
  82-000941
 Life History/General
  82-002421
 Reproduction
  82-002421
 Spawning
  82-002421
Gastromyzon
 Taxonomy
  82-001769
Genicanthus melanospilos
 Hermaphroditism
  82-002278
Geotria australis
 Biochemical Composition
  82-000087
 Blood Chemistry
  82-001454
  82-001455
  82-002306
 Dentition
  82-000062
 Metamorphosis
  82-000062
  82-000087
 Mouth Parts
  82-000062
 Temperature
  82-001454
Gephyroglanis barnardi
 New Species
  82-001023
Gerreidae
 Distribution/Factors of
  82-002679
 Distribution/Geographical
  82-002679
 Fish Lists/Keys
  82-002679
Gerres
 Foods/Feeding
  82-002537

# SYSTEMATIC INDEX

...CONTINUED...

- Gerres
  - Mouth Parts
    - 82-002537
- Gigantactinidae
  - Distribution/Geographical
    - 82-001000
  - Taxonomy
    - 82-001000
- Gila
  - Distribution/Geographical
    - 82-000986
  - Status
    - 82-000986
- Gila bicolor
  - Competition
    - 82-002556
  - Embryology
    - 82-002485
  - Foods/Feeding
    - 82-002556
  - Predator/Prey Relationships
    - 82-001554
  - Schooling Behavior
    - 82-001554
  - Spawning
    - 82-002485
- Gila bicolor mohavensis
  - Habitat Alterations
    - 82-001173
  - Status
    - 82-001173
- Gila boraxobius
  - Status
    - 82-001151
- Gila cypha
  - Distribution/Geographical
    - 82-001029
  - Taxonomy
    - 82-001029
- Gila robusta
  - Foods/Feeding
    - 82-002566
- Gilchristella aestuarius
  - Body Form
    - 82-000044
- Gillichthys mirabilis
  - ATP
    - 82-000662
  - Endocrinology
    - 82-002307
  - Hormones
    - 82-002307
  - Osmoregulation
    - 82-000125
    - 82-000126
    - 82-000662
  - Rubidium
    - 82-000125
- Girella nigricans
  - Cleaning Behavior
    - 82-000180
- Glaniopsis
  - Taxonomy
    - 82-001769
- Glenoglossa
  - New Genus
    - 82-002697
- Glenoglossa wassi
  - New Species
    - 82-002697
- Glyptocephalus cynoglossus
  - Meristic Studies
    - 82-001356
- Glyptothorax pectinopterum
  - Foods/Feeding
    - 82-000903
- Gnathonemus petersii
  - Electrical Communication
    - 82-000191
- Gobio
  - Variation Studies
    - 82-001369
- Gobio gobio
  - Age/Growth
    - 82-002596
  - Mersitic Studies
    - 82-000058
  - Population Studies
    - 82-002596
- Gobiomorphus cotidianus
  - Age/Growth
    - 82-000850
  - Mortality Rates
    - 82-000850
  - Spawning
    - 82-000850
- Gobiosoma
  - Cleaning Behavior
    - 82-002401
- Gobiosoma bosci
  - Spawning
    - 82-001628
- Gobiosoma illecebrosum
  - Hermaphroditism
    - 82-000723
- Gobiosoma multifasciatum
  - Hermaphroditism
    - 82-000723
- Gobiosoma saucrum
  - Hermaphroditism
    - 82-000723
- Gonostoma atlanticum
  - Early Development
    - 82-000072
- Gonostomatidae
  - Early Development
    - 82-002127
- Goodeidae
  - Seismosensory System
    - 82-002150

...CONTINUED...
Goodeidae
  Taxonomy
    82-002150
Guavina guavina
  Parasites/Diseases
    82-001853
  Styphlotrema artigasi
    82-001853
  Trematodes
    82-001853
Gymnocanthus detrisus
  Fecundity
    82-002510
  Maturation
    82-002510
Gymnothorax enigmaticus
  Taxonomy
    82-001761
Gymnothorax ruppeli
  Taxonomy
    82-001761
Gymnotiformes
  Electric Organs
    82-001574
Haemulon aurolineatum
  Life History/General
    82-002428
Haemulon sciurus
  Oil
    82-001140
  Phenanthrene
    82-001140
Haemulopsis
  Taxonomy
    82-001013
Halichoeres
  Taxonomy
    82-001765
Halidesmus
  Taxonomy
    82-001776
Haplochromis
  Life History/General
    82-000840
Haplochromis barbarae
  Foods/Feeding
    82-000940
Haplochromis burtoni
  Maturation
    82-002263
  Social Behavior
    82-002263
  Spawning
    82-001629
  Vision
    82-001364
Haplochromis elegans
  Musculature
    82-002121

...CONTINUED...
Haplochromis elegans
  Vision
    82-000620
Haplochromis livingstoni
  Death Feigning
    82-000190
Hemichromis bimaculatus
  Caffeine
    82-001898
  Scales
    82-000626
  Temperature
    82-000731
  Vision
    82-002391
Hemiglyphidodon plagiometopo
  Territorial Behavior
    82-000818
Hemiodopsis ocellata
  New Species
    82-001772
Hemitripterus americanus
  Temperature
    82-000817
  Temperature Selection
    82-000817
Hermosilla azurea
  Cleaning Behavior
    82-000180
Heterodontus portusjacksoni
  Reproductive System
    82-002155
Heteropneustes fossilis
  Blood Chemistry
    82-001109
  Chlorinated Hydrocarbons
    82-002860
  Culture/Propagation
    82-000553
  Digestive System
    82-000670
  Endocrinology
    82-000740
    82-001446
    82-002352
  Endrin
    82-002860
  Feeding Experiments
    82-000553
  Formothion
    82-002856
  Gas Bubble Disease
    82-001075
  Hormones
    82-000740
    82-001446
  Insecticides
    82-001109
    82-001138

## SYSTEMATIC INDEX

...CONTINUED...
- Heteropneustes fossilis
  - Insecticides
    - 82-002856
    - 82-002860
  - Parasites/Disease
    - 82-001075
  - Reproduction
    - 82-000740
    - 82-002352
  - Sewage Effluents
    - 82-001109
  - Thiodan
    - 82-001138
  - Vitellogenin
    - 82-000740
    - 82-002352
- Heterostichus rostratus
  - Spawning
    - 82-001627
- Himantura signifer
  - New Species
    - 82-002678
- Hippoglossoides platessoides
  - Digestion Rates
    - 82-001453
- Hippoglossus hippoglossus
  - Embryology
    - 82-002168
- Hippoglossus stenolepis
  - Fishing Gear
    - 82-001993
  - Management/Research--Marine
    - 82-002029
    - 82-002888
  - Population Studies
    - 82-002456
  - Year Class Strength
    - 82-002456
- Hispidoberycidae
  - New Family
    - 82-002691
- Hispidoberyx
  - New Genus
    - 82-002691
- Hispidoberyx ambagiosus
  - New Species
    - 82-002691
- Holacanthus tricolor
  - Coloration
    - 82-002136
  - Spawning
    - 82-002502
- Holanthias martinicensis
  - Hermaphroditism
    - 82-000092
- Hoplostethus atlanticus
  - Heavy Metals
    - 82-000417
  - Mercury
    - 82-000417
- Hucho hucho
  - Culture/Propagation
    - 82-000010
  - Early Development
    - 82-000010
  - Embryology
    - 82-000010
- Huso huso x Acipenser stellatus
  - Hybridization
    - 82-000165
  - Morphology
    - 82-000165
- Hydrolagus colliei
  - Endocrinology
    - 82-002253
  - Excretory System
    - 82-002180
  - Histology
    - 82-002180
- Hyphessobrycon pulchripinnis
  - Reproduction
    - 82-001632
  - Spawning
    - 82-001632
- Hypleurochilus aequipinnis
  - Taxonomy
    - 82-000333
- Hypleurochilus geminatus
  - Spawning
    - 82-001628
- Hypodytes rubripinnis
  - Life History/General
    - 82-000219
  - Spawning
    - 82-000219
- Hypomesus transpacificus nipponensis
  - Reproductive System
    - 82-002199
- Hypophthalmichthys
  - Anatomy
    - 82-000344
  - Taxonomy
    - 82-000344
- Hypophthalmichthys molitrix
  - Culture/Propagation
    - 82-000415
    - 82-000536
  - Distribution/Geographical
    - 82-002624
  - Electrophoresis
    - 82-002331
  - Foods/Feeding
    - 82-001646
  - Gills
    - 82-000056
  - Induced Maturation
    - 82-000536
  - Nutrition
    - 82-000032

## SYSTEMATIC INDEX

...CONTINUED...
Hypophthalmichthys molitrix
Respiratory System
82-000056
Sewage Effluents
82-000415
Spawning
82-002498
Status
82-002624
Hypoprion bigelowi
Dentition
82-000623
Taxonomy
82-000623
Hyporhamphus delagoae
Taxonomy
82-002677
Hyporhamphus improvisus
Taxonomy
82-002677
Hypostomus
Temperature
82-000731
Hypostomus plecostomus
Air Breathing
82-000671
Hypostomus regani
Air Breathing
82-000100
Blood Chemistry
82-000100
Hypseleotris dayi
Distribution/Geographical
82-001715
Hypselognathus horridus
New Species
82-002680
Hypsoblennius ionthas
Spawning
82-001628
Hypsurus caryi
Temperature Selection
82-000822
Hysterocarpus traski
Life History/General
82-001590
Icelidae
Skeletal System
82-001031
Taxonomy
82-001031
Ichthyococcus
Distribution/Geographical
82-000350
Taxonomy
82-000350
Ichthyomyzon gagei
Life History/General
82-002223

...CONTINUED...
Ichthyomyzon gagei
Metamorphosis
82-002223
Ichthyomyzon unicuspis
Locomotion
82-000651
Nervous System
82-000651
Ictaluridae
Life History/General
82-000833
Ictalurus
Brood Stock
82-001288
Culture/Propagation
82-001288
Ictalurus brunneus
Karyotypes
82-001005
Variation Studies
82-001005
Ictalurus furcatus
Blood Chemistry
82-001389
Culture/Propagation
82-001299
Hybridization
82-001299
Induced Maturation
82-001299
Stress
82-001389
Ictalurus hazenensis
New Species
82-000999
Paleontology
82-000999
Ictalurus melas
Age/Growth
82-002997
Blood Chemistry
82-001411
Endocrinology
82-001411
Gas Bubble Disease
82-000672
Gas Supersaturation
82-000672
Hormones
82-001475
Karyotypes
82-001524
Management/Research--Ponds
82-002997
Parasites/Diseases
82-000672
Stocking/Introductions
82-002997
Ictalurus natalis
Karyotypes
82-001524

...CONTINUED...

Ictalurus nebulosus
  Age/Growth
    82-000950
    82-002603
  Cadmium
    82-001907
  Condition Factors
    82-002603
  Digestive System
    82-000714
  Electroreception
    82-000746
  Foods/Feeding
    82-000920
  Heavy Metals
    82-001907
  Metabolic Rates
    82-002243
  Nervous System
    82-002256
  Nutrient Cycling
    82-000041
  Phosphorus
    82-000041
  Reproductive System
    82-000714
  Temperature
    82-002243
Ictalurus platycephalus
  Karyotypes
    82-001005
  Variation Studies
    82-001005
Ictalurus punctatus
  Aeration
    82-001340
  Aeromonas hydrophila
    82-001047
    82-001804
  Age/Growth
    82-000292
    82-001678
    82-002604
  Alarm Cells
    82-000631
  Ambiphrya ameiuri
    82-001811
  Anesthetics
    82-001913
    82-001920
  Arsenic
    82-000440
  Bacterial Diseases
    82-001047
    82-001802
    82-001804
    82-001904
    82-002729

...CONTINUED...
Ictalurus punctatus
  Bayer 73
    82-002868
  Biofiltration
    82-000537
  Blood
    82-000789
  Blood Chemistry
    82-001389
    82-001511
    82-002228
    82-002232
  Cage Culture
    82-000524
  Copper
    82-001904
  Culture/Propagation
    82-000015
    82-000016
    82-000496
    82-000524
    82-000535
    82-000537
    82-000538
    82-000548
    82-000555
    82-000557
    82-001289
    82-001293
    82-001299
    82-001303
    82-001327
    82-002062
    82-002079
    82-002082
    82-002094
  Diets
    82-000557
    82-002079
  Edwardsiella ictaluri
    82-001802
  Edwardsiella tarda
    82-002729
  Endocrinology
    82-002217
  Enzymes
    82-001428
  Etomidate
    82-001920
  Excretory System
    82-002233
  Feeding Experiments
    82-000548
    82-000555
    82-001303
    82-001327
    82-002079
    82-002082
    82-002094

## SYSTEMATIC INDEX

...CONTINUED...
- Ictalurus punctatus
  - Feeds
    - 82-000555
    - 82-000557
    - 82-001303
    - 82-001327
    - 82-002082
    - 82-002094
  - Filtration Systems
    - 82-000538
  - Formalin
    - 82-001899
  - Genetic Strains
    - 82-001293
  - Gill Parasites
    - 82-001811
  - Heavy Metals
    - 82-000440
    - 82-001904
  - Hybridization
    - 82-001299
  - Hydroponics
    - 82-000537
  - Ichthyophthiriasis
    - 82-001904
  - Ichthyophthirius multifiliis
    - 82-001904
  - Immune Response
    - 82-001802
  - Immunization
    - 82-001047
  - Induced Maturation
    - 82-001299
  - Insecticides
    - 82-002852
  - Iodine
    - 82-001919
  - Kepone
    - 82-002852
  - Marketing
    - 82-000496
  - MS-222
    - 82-001913
  - Nitrite
    - 82-001913
  - Nitrogen Metabolism
    - 82-002079
  - Parasites/Diseases
    - 82-001047
    - 82-001068
    - 82-001340
    - 82-001802
    - 82-001804
    - 82-001811
    - 82-001904
    - 82-002729
  - Piscicides
    - 82-000104
    - 82-002868

...CONTINUED...
- Ictalurus punctatus
  - Polyculture
    - 82-000015
  - Polyploidy
    - 82-000789
  - Pond Culture
    - 82-001340
    - 82-002062
  - Population Studies
    - 82-000862
  - Protozoan Diseases
    - 82-001811
  - Recirculating System
    - 82-000538
  - Reproductive System
    - 82-002179
  - Selective Breeding
    - 82-000524
    - 82-001293
  - Skeletal System
    - 82-000104
  - Spawning
    - 82-000862
  - Stress
    - 82-001389
    - 82-001511
  - Taste and Odor Problems
    - 82-001289
  - Temperature
    - 82-002232
  - Toxaphene
    - 82-000104
  - Trematodes
    - 82-001068
  - Triploid Fish
    - 82-000172
    - 82-000789
    - 82-000790
  - Vision
    - 82-002186
  - Vitamins
    - 82-000104
    - 82-002729
- Ictalurus punctatus X I. furcatus
  - Hybridization
    - 82-002378
- Ictiobus cyprinellus
  - Embryology
    - 82-000065
  - Tuberculation
    - 82-000618
- Iotichthys phlegethontis
  - Foods/Feeding
    - 82-000906
  - Habitat Selection
    - 82-000906
- Iranocichla hormuzensis
  - New Species
    - 82-001003

...CONTINUED...

Istiophoridae
  Age/Growth
    82-001691
  Management/Research--Marine
    82-002020
    82-002027
Istiophorus gladius
  Distribution/Geographical
    82-002614
  Foods/Feeding
    82-002614
  Length Frequencies
    82-002614
Isurus oxyrinchus
  Foods/Feeding
    82-001668
Jenynsia lineata
  Reproductive System
    82-000051
Johnius sina
  Maturation
    82-002507
  Spawning
    82-002507
Jordanella floridae
  Heavy Metals
    82-002845
  Silver
    82-002845
Kareius bicoloratus
  Abundance/Factors of
    82-001742
  Life History/General
    82-001742
Katsuwonus pelamis
  Age/Growth
    82-000300
    82-002577
  Harvest
    82-002577
  Management/Research--Marine
    82-003023
  Metallothionein
    82-001509
Labeo rohita
  Abnormalities
    82-002152
  Biochemical Composition
    82-002271
  Culture/Propagation
    82-000574
    82-002152
  Gamete Storage
    82-000574
  Vision
    82-002271
Labeo werneri
  Taxonomy
    82-000354
Labidesthes sicculus
  Competition
    82-001657
  Foods/Feeding
    82-001657
Labidochromis
  Fish Lists/Keys
    82-002694
  Taxonomy
    82-002694
Labroides dimidiatus
  Cleaning Behavior
    82-000807
  Early Development
    82-000076
Labropsis
  New Species
    82-001767
  Taxonomy
    82-001767
Lagocephalus sceleratus
  Distribution/Geographical
    82-000307
Lagodon rhomboides
  Foods/Feeding
    82-000934
    82-002571
  Predator/Prey Relationships
    82-000934
    82-001643
Lampanycutus macropterus
  Distribution/Geographical
    82-000335
  Identification
    82-000335
  Taxonomy
    82-000335
Lampetra aepyptera
  Distribution/Geographical
    82-001605
  Endocrinology
    82-001402
  Life History/General
    82-001605
  Morphology
    82-001605
Lampetra appendix
  Fecundity
    82-001599
  Life History/General
    82-001599
Lampetra macrostoma
  New Species
    82-001749
Lampetra planeri
  Foods/Feeding
    82-000925
Lampetra richardsoni
  Ophioxenos lampetrae
    82-002756

...CONTINUED...
Lampetra richardsoni
  Parasites/Diseases
    82-002756
  Trematodes
    82-002756
Lateolabrax japonicus
  Condition Factors
    82-001631
  Movements
    82-001631
Lates calcarifer
  Age/Growth
    82-002600
  Life History/General
    82-002501
  Movements
    82-002524
  Spawning
    82-002501
  Spawning Migration
    82-002524
Latimeria chalumnae
  Electroreception
    82-001353
  Rostral Organ
    82-001353
Latridopsis ciliaris
  Spawning Migration
    82-000246
Leiognathidae
  Fins
    82-000625
  Skeletal System
    82-000625
Leiostomus xanthurus
  Bromate
    82-000436
  Carbon
    82-002272
  Enzymes
    82-001496
  Malate Dehydrogenase
    82-001496
    82-001497
  Metabolic Rates
    82-002272
  Temperature
    82-000107
    82-001496
    82-001497
  Thermal Shock
    82-000107
Lepidomeda mollispinis
  Life History/General
    82-000844
Lepidopus dubius
  New Species
    82-002703
Lepisosteus osseus
  Electrophoresis
    82-002264

...CONTINUED...
Lepisosteus osseus
  Embryology
    82-000613
  Enzymes
    82-002264
Lepisosteus platyrhynchus
  Corpuscle of Stannius
    82-000594
Lepomis
  Age/Growth
    82-001681
  Condition Factors
    82-001681
  Hybridization
    82-002995
  Identification
    82-000336
  Management/Research--Ponds
    82-002995
  Spawning
    82-002493
Lepomis auritus
  Management/Research--Lakes
    82-002981
  Population Studies
    82-002981
Lepomis auritus X Micropterus salmoides
  Hybridization
    82-001536
Lepomis cyanellus
  Acanthocephala
    82-002782
  Lebertia
    82-002763
  Leptorhynchoides thecatus
    82-002782
  Mites
    82-002763
  Nervous System
    82-000192
  Parasites/Diseases
    82-002763
    82-002782
  Temperature
    82-000192
Lepomis cyanellus X L. microlophus
  Hybridization
    82-001255
  Management/Research--Ponds
    82-001255
Lepomis gibbosus
  Actinocleidus oculatus
    82-000381
  Actinocleidus recurvatus
    82-000381
  Fins
    82-002166
  Foods/Feeding
    82-001665

# SYSTEMATIC INDEX

...CONTINUED...
Lepomis gibbosus
  Myxobolus osburni
    82-001051
  Parasites/Diseases
    82-000381
    82-001051
  Protozoan Diseases
    82-001051
  Skeletal System
    82-002166
  Trematodes
    82-000381
  Trophic Relationships
    82-001665
Lepomis gulosus
  Foods/Feeding
    82-001665
  Trophic Relationships
    82-001665
Lepomis macrochirus
  Abundance/Factors of
    82-001613
  Aeration
    82-001175
  Age/Growth
    82-001175
    82-001594
    82-002997
  Anesthetics
    82-001920
  Bioassay Techniques
    82-001469
  Black-Spot Disease
    82-001076
  Competition
    82-002570
  Etomidate
    82-001920
  Foods/Feeding
    82-000200
    82-000274
    82-001594
    82-001665
    82-002570
  Foods/Feeding/Selectivity
    82-001644
  Forage Introductions
    82-001175
  Harvest
    82-002922
  Heavy Metals
    82-001118
    82-002832
  Hydrazine
    82-000426
  Insecticides
    82-002852
  Kepone
    82-002852

...CONTINUED...
Lepomis macrochirus
  Lead
    82-002832
  Management/Research--Ponds
    82-002993
    82-002997
  Management/Research--Reservoirs
    82-001175
    82-001594
  Mercury
    82-001118
  Nematodes
    82-001074
  Nitrite
    82-001122
  Parasites/Diseases
    82-001074
    82-001076
    82-001787
    82-001788
  pH
    82-000411
  Pollution Avoidance
    62-000411
  Population Studies
    82-000225
    82-001594
    82-001613
  Predator/Prey Relationships
    82-000274
    82-001644
    82-001663
  Respiration
    82-001469
  Spinitectus carolini
    82-001074
  Stocking/Introductions
    82-002997
  Supplemental Feeding
    82-002993
  Trematodes
    82-001076
  Trophic Relationships
    82-001665
  Uvulifer ambloplitis
    82-001076
  Year Class Strength
    82-001613
Lepomis macrochirus X Micropterus salmoides
  Hybridization
    82-001536
Lepomis megalotis
  Age/Growth
    82-001594
  Foods/Feeding
    82-001594
  Management/Research--Reservoirs
    82-001594
  Population Studies
    82-001594

...CONTINUED...
- Lepomis microlophus X L. cyanellus
  - Hybridization
    - 82-001255
  - Management/Research--Ponds
    - 82-001255
- Lepomis microlophus X Micropterus salmoides
  - Hybridization
    - 82-001536
- Leptocottus armatus
  - Oil Refinery Effluents
    - 82-001135
- Lesueurigobius friesii
  - Life History/General
    - 82-002431
- Lethrinus
  - Hermaphroditism
    - 82-002370
- Lethrinus mahsena
  - Age/Growth
    - 82-000951
  - Condition Factors
    - 82-000951
- Lethrinus xanthochilus
  - Age/Growth
    - 82-000951
  - Condition Factors
    - 82-000951
- Leucaspius delineatus
  - Age/Growth
    - 82-002596
  - Population Studies
    - 82-002596
- Leuciscus cephalus
  - Age/Growth
    - 82-000297
- Leuciscus leuciscus
  - Abundance/Factors of
    - 82-001744
  - Mortality Factors
    - 82-001744
  - Rheotropism
    - 82-001577
  - Scales
    - 82-002126
- Leuresthes tenuis
  - Abundance/Factors of
    - 82-001403
  - Temperature
    - 82-001403
- Leuroglossus schmidti
  - Taxonomy
    - 82-001017
- Leuroglossus stilbius
  - Taxonomy
    - 82-001017
- Limanda herzensteini
  - Abundance/Factors of
    - 82-001742

...CONTINUED...
- Limanda herzensteini
  - Life History/General
    - 82-001742
- Limanda limanda
  - Parasites/Diseases
    - 82-001861
- Limanda yokohamae
  - Reproduction
    - 82-000138
    - 82-001474
- Limnichthys donaldsoni
  - Early Development
    - 82-000614
  - Embryology
    - 82-000614
  - Movements
    - 82-000614
- Limnothrissa miodon
  - Abundance/Factors of
    - 82-001743
  - Biochemical Composition
    - 82-001399
  - Flow Regimes
    - 82-001743
  - Harvest
    - 82-001743
  - Management/Research--Reservoirs
    - 82-001743
- Liopsetta putnami
  - Culture/Propagation
    - 82-001309
  - Heated Water
    - 82-001309
- Liparididae
  - Life History/General
    - 82-000218
- Lithognathus mormyrus
  - Foods/Feeding/Selectivity
    - 82-002548
- Liza aurata
  - Culture/Propagation
    - 82-001305
  - Foods/Feeding/Selectivity
    - 82-000912
  - Pond Culture
    - 82-001305
  - Temperature
    - 82-001305
- Liza ramada
  - Foods/Feeding/Selectivity
    - 82-000912
  - Management/Research--Lakes
    - 82-002978
- Liza saliens
  - Management/Research--Lakes
    - 82-002978
- Lophogobius cyprinoides
  - Foods/Feeding
    - 82-000268

...CONTINUED...

- Lopholatilus chamaeleonticeps
  - Burrowing Behavior
    - 82-001547
  - Longlines
    - 82-001206
- Loricaria uracantha
  - Spawning
    - 82-000887
- Loricariidae
  - Foods/Feeding
    - 82-001660
- Lucania parva
  - Escape Behavior
    - 82-001548
- Luciocephalus pulcher
  - Foods/Feeding
    - 82-000060
  - Mouth Parts
    - 82-000060
- Lutjanidae
  - Fish Lists/Keys
    - 82-000978
  - Population Studies
    - 82-001620
- Lutjanus analis
  - Age/Growth
    - 82-000296
- Lutjanus campechanus
  - Age/Growth
    - 82-001685
  - Length-Weight Relationships
    - 82-001685
  - Mortality Rates
    - 82-001685
- Lutjanus synagris
  - Fecundity
    - 82-002486
- Lycodes lavalaei
  - X-cells
    - 82-002765
- Macrognathus aculeatum
  - Age/Growth
    - 82-002597
  - Length-Weight Relationships
    - 82-002597
- Macropodus
  - Nervous System
    - 82-000093
  - Olfaction
    - 82-000093
- Macrouridae
  - Biochemical Composition
    - 82-002344
  - Distribution/Vertical
    - 82-002344
  - Enzymes
    - 82-002344
  - Life History/General
    - 82-000218

...CONTINUED...

- Macrouridae
  - Swimbladder
    - 82-000595
- Macrourus berglax
  - Cestodes
    - 82-002760
  - Macruricotyle newfoundlandiae
    - 82-002760
  - Parabothriocephalus macruri
    - 82-002760
  - Parasites/Diseases
    - 82-002760
  - Trematodes
    - 82-002760
- Macrozoarces americanus
  - Digestion Rates
    - 82-001453
- Macruronus novaezelandiae
  - Biochemical Composition
    - 82-002360
  - Lipid Content
    - 82-002360
- Makaira indica
  - Life History/General
    - 82-002033
  - Management/Research--Marine
    - 82-002033
- Malacosteus niger
  - Vision
    - 82-002197
- Mallotus villosus
  - Abundance/Factors of
    - 82-000329
  - Age/Growth
    - 82-001592
    - 82-002666
  - Enzymes
    - 82-001423
  - Foods/Feeding
    - 82-000909
    - 82-002536
    - 82-002666
  - Mortality Rates
    - 82-002666
  - Predator/Prey Relationships
    - 82-002536
    - 82-002541
  - Swimming Performance
    - 82-001592
  - Temperature
    - 82-001592
  - Trophic Relationships
    - 82-002536
  - Wind
    - 82-002541
  - Year Class Strength
    - 82-000329
- Mallotus villosus villosus
  - Reproductive System
    - 82-000605

...CONTINUED...

- Marcusenius isidori
  - Coloration
    - 82-000081
- Marcusenius longianalis
  - Coloration
    - 82-000081
- Maurolicus muelleri
  - Maturation
    - 82-002513
  - Spawning
    - 82-002513
- Meda fulgida
  - Foods/Feeding
    - 82-002566
- Medialuna californiensis
  - Distribution/Geographical
    - 82-000318
- Megalaspis cordyla
  - Harvest
    - 82-002446
  - Life History/General
    - 82-002446
- Melanochromis crabro
  - Cleaning Behavior
    - 82-002707
  - Foods/Feeding
    - 82-002707
  - New Species
    - 82-002707
- Melanogrammus aeglefinus
  - Age/Growth
    - 82-002607
  - Coloration
    - 82-000604
  - Maturation
    - 82-002607
  - Parasites/Diseases
    - 82-001038
    - 82-002724
  - Reproductive System
    - 82-001378
  - Year Class Strength
    - 82-000235
- Menidia beryllina
  - Competition
    - 82-001657
    - 82-002570
  - Foods/Feeding
    - 82-001657
    - 82-002570
  - Life History/General
    - 00-000000
  - Oil
    - 82-001139
  - Population Studies
    - 00-000000
- Menidia clarkhubbsi
  - New Species
    - 82-002682

...CONTINUED...

- Menidia clarkhubbsi
  - Unisex Populations
    - 82-002682
- Menidia menidia
  - Abundance/Factors of
    - 82-001741
  - Movements
    - 82-001741
    - 82-002518
  - Sex Determination
    - 82-001741
  - Spawning
    - 82-000252
    - 82-000253
    - 82-001741
  - Temperature
    - 82-001741
- Menidia peninsulae
  - Foods/Feeding
    - 82-001656
  - Life History/General
    - 82-001656
- Merlangius merlangus
  - Anasakis
    - 82-002766
  - Blood Chemistry
    - 82-002766
  - Contracaecum
    - 82-002766
  - Nematodes
    - 82-002766
  - Parasites/Diseases
    - 82-002766
- Merluccius bilinearis
  - Age/Growth
    - 82-000293
  - Distribution/Geographical
    - 82-000293
  - Mortality Rates
    - 82-002663
- Merluccius gayi
  - Anisakis
    - 82-001063
  - Nematodes
    - 82-001063
  - Parasites/Diseases
    - 82-001063
- Merluccius hubbsi
  - Biomass
    - 82-002470
  - Harvest
    - 82-003020
  - Management/Research--Marine
    - 82-003020
  - Meristic Studies
    - 82-002138
  - Morphology
    - 82-002138
  - Population Studies
    - 82-000242

# SYSTEMATIC INDEX

...CONTINUED...
- Merluccius hubbsi
  - Population Studies
    - 82-000480
  - Spawning
    - 82-000242
  - Standing Crop
    - 82-002470
- Merluccius polylepis
  - Biomass
    - 82-002470
  - Meristic Studies
    - 82-002138
  - Morphology
    - 82-002138
  - Standing Crop
    - 82-002470
- Merluccius productus
  - Kudoa
    - 82-000375
  - Parasites/Diseases
    - 82-000375
    - 82-001816
  - Protozoan Diseases
    - 82-000375
    - 82-001816
- Microdesmus longipinnis
  - Distribution/Geographical
    - 82-000980
- Microgadus tomcod
  - Antifreeze Production
    - 82-000667
  - Polychlorinated Biphenyls
    - 82-000405
- Microgeophagus
  - Taxonomy
    - 82-001022
- Micrognathus pygmaeus
  - New Species
    - 82-000343
- Micromesistius poutassou
  - Life History/General
    - 82-001612
  - Population Studies
    - 82-001612
- Micrometrus minimus
  - Temperature
    - 82-000822
  - Temperature Selection
    - 82-000822
- Microphis cruentus
  - New Species
    - 82-001753
- Micropogon undulatus
  - Liver
    - 82-002146
- Micropogonias undulatus
  - Abundance/Factors of
    - 82-002665
  - Age/Growth
    - 82-000960

...CONTINUED...
- Micropogonias undulatus
  - Salinity
    - 82-002665
  - Spawning
    - 82-000960
  - Temperature
    - 82-002665
- Micropterus
  - Competition
    - 82-000267
  - Culture/Propagation
    - 82-001531
  - Electrophoresis
    - 82-001531
  - Foods/Feeding
    - 82-000267
  - Genetic Strains
    - 82-001531
  - Hybridization
    - 82-000787
- Micropterus dolomieui
  - Abundance/Factors of
    - 82-002667
  - Activity Patterns
    - 82-000812
  - Age/Growth
    - 82-002667
  - Culture/Propagation
    - 82-000564
  - Diets
    - 82-000564
  - Feeds
    - 82-000564
  - Habitat Selection
    - 82-000812
  - Temperature
    - 82-002667
- Micropterus salmoides
  - Aeration
    - 82-001175
  - Age/Growth
    - 82-001175
    - 82-001594
    - 82-001684
    - 82-001699
    - 82-002346
    - 82-002460
    - 82-002588
  - Bacterial Diseases
    - 82-002732
  - Bayer 73
    - 82-002868
  - Bioenergetics
    - 82-002216
  - Biomass
    - 82-002460
  - Competition
    - 82-002570
  - Condition Factors
    - 82-002588

...CONTINUED...
- Micropterus salmoides
  - Culture/Propagation
    - 82-000543
    - 82-001302
  - Diets
    - 82-000543
  - Digestion Rates
    - 82-001648
    - 82-001664
  - Electrofishing
    - 82-001983
  - Electrophoresis
    - 82-001532
  - Exploitation Rates
    - 82-001226
  - Feeding Experiments
    - 82-001302
  - Feeds
    - 82-000543
  - Fin Clipping
    - 82-002931
  - Foods/Feeding
    - 82-000916
    - 82-000935
    - 82-001594
    - 82-001648
    - 82-001665
    - 82-002530
    - 82-002567
    - 82-002570
  - Foods/Feeding/Selectivity
    - 82-000936
    - 82-001664
  - Forage Introductions
    - 82-001175
  - Genetic Strains
    - 82-000778
    - 82-001302
  - Helminths
    - 82-001852
  - Immunization
    - 82-002732
  - Management/Research--Lakes
    - 82-002460
    - 82-002981
  - Management/Research--Ponds
    - 82-002997
  - Management/Research--Reservoirs
    - 82-001175
    - 82-001594
  - Marking/Tagging
    - 82-002931
    - 82-002936
  - Metabolic Rates
    - 82-002216
  - Mortality Rates
    - 82-002460
    - 82-002465
  - Myxobilatus mictospora
    - 82-001049

...CONTINUED...
- Micropterus salmoides
  - Nets/Netting
    - 82-001983
  - Otoliths
    - 82-001684
    - 82-001699
  - Parasites/Diseases
    - 82-001049
    - 82-001852
    - 82-002725
    - 82-002732
  - Piscicides
    - 82-002868
  - Population Studies
    - 82-000225
    - 82-001594
    - 82-001983
    - 82-002460
    - 82-002465
    - 82-002981
    - 82-003028
  - Predator/Prey Relationships
    - 82-000916
    - 82-000936
    - 82-001663
    - 82-001664
    - 82-002530
  - Protozoan Diseases
    - 82-001049
  - Regulations
    - 82-002460
    - 82-002928
  - Sampling
    - 82-001983
  - Scales
    - 82-002346
  - Size Limits
    - 82-002460
    - 82-002928
  - Spawning
    - 82-000886
  - Stocking/Introductions
    - 82-002997
  - Temperature
    - 82-000652
    - 82-002346
    - 82-002530
  - Temperature Selection
    - 82-000652
  - Trophic Relationships
    - 82-001665
  - Variation Studies
    - 82-000778
  - Water Level Fluctuations
    - 82-000886
- Micropterus salmoides floridanus
  - Age/Growth
    - 82-000956
  - Age/Grwoth
    - 82-001260

# SYSTEMATIC INDEX

...CONTINUED...

- Micropterus salmoides floridanus
  - Catchability
    - 82-001260
  - Culture/Propagation
    - 82-001301
  - Management/Research--Reservoirs
    - 82-001260
  - Mortality Rates
    - 82-001260
  - Movements
    - 82-000897
  - Power Plant Effluents
    - 82-000897
  - Temperature
    - 82-000649
    - 82-000897
  - Thermal Pollution
    - 82-000897
  - Thermal Shock
    - 82-000649
- Micropterus salmoides salmoides
  - Age/Growth
    - 82-000956
    - 82-001260
  - Catchability
    - 82-001260
  - Management/Research--Reservoirs
    - 82-001260
  - Mortality Rates
    - 82-001260
  - Movements
    - 82-000897
  - Power Plant Effluents
    - 82-000897
  - Temperature
    - 82-000649
    - 82-000897
  - Thermal Pollution
    - 82-000897
  - Thermal Shock
    - 82-000649
- Microstomus pacificus
  - Age/Growth
    - 82-000954
  - Foods/Feeding/Selectivity
    - 82-000911
  - Upwelling
    - 82-000954
- Minyichthys sentus
  - New Species
    - 82-002681
- Minytrema melanops
  - Lissorchis
    - 82-001843
  - Parasites/Diseases
    - 82-001843
  - Trematodes
    - 82-001843
- Mirolabrichthys
  - Taxonomy
    - 82-001021
- Misgurnus anguillicaudatus
  - Enzymes
    - 82-001473
  - Foods/Feeding/Selectivity
    - 82-000914
  - Reproduction
    - 82-000743
    - 82-001473
  - Reproductive System
    - 82-001376
  - Vitellogenin
    - 82-000743
- Misgurnus fossilis
  - Radionuclides
    - 82-002841
- Moridae
  - Swimbladder
    - 82-000595
  - Taxonomy
    - 82-001025
- Mormyriformes
  - Electric Organs
    - 82-001574
- Morone americana
  - Embryology
    - 82-001465
  - Foods/Feeding
    - 82-000933
  - Harvest
    - 82-001263
  - Life History/General
    - 82-001610
    - 82-002454
  - Management/Research--Estuaries
    - 82-001263
  - Management/Research--General
    - 82-001610
    - 82-002454
  - Population Studies
    - 82-001621
  - Production
    - 82-001263
  - Salinity
    - 82-001465
  - Temperature
    - 82-001465
  - Year Class Strength
    - 82-001621
- Morone chrysops
  - Age/Growth
    - 82-001683
    - 82-001690
  - Length-Weight Relationships
    - 82-001690
- Morone mississippiensis
  - Age/Growth
    - 82-000944
  - Distribution/Geographical
    - 82-001730

...CONTINUED...
- Morone mississippiensis
  - Management/Research--Reservoirs
    - 82-000944
  - Population Studies
    - 82-000944
- Morone saxatilis
  - Age/Growth
    - 82-001676
    - 82-001690
  - Bioenergetics
    - 82-000694
  - Bromate
    - 82-000436
  - Cannibalism
    - 82-000013
  - Culture/Propagation
    - 82-000013
    - 82-000558
    - 82-000559
    - 82-001286
    - 82-001325
  - Diets
    - 82-000558
  - Distribution/Seasonal
    - 82-002517
  - Feeding Experiments
    - 82-000558
    - 82-000559
    - 82-001325
  - Feeds
    - 82-000558
    - 82-000559
    - 82-001325
  - Fingerling Production
    - 82-001286
  - Foods/Feeding
    - 82-000931
    - 82-000933
  - Insecticides
    - 82-002802
  - Kepone
    - 82-002802
  - Length-Weight Relationships
    - 82-001690
  - Life History/General
    - 82-000209
  - Management/Research--Reservoirs
    - 82-001256
  - Movements
    - 82-001638
    - 82-002517
  - Pollution
    - 82-001103
  - Pond Culture
    - 82-001286
  - Population Studies
    - 82-000209
  - Skeletal System
    - 82-001103

...CONTINUED...
- Morone saxatilis
  - Stocking/Introductions
    - 82-002940
  - Suspended Solids
    - 82-001105
  - Swimbladder
    - 82-002241
  - Temperature
    - 82-000150
    - 82-000694
  - Turbidity
    - 82-001105
- Morone saxatilis X M. chrysops
  - Age/Growth
    - 82-001690
  - Culture/Propagation
    - 82-000014
  - Hybridization
    - 82-002015
  - Length-Weight Relationships
    - 82-001690
  - Management/Research--Ponds
    - 82-002015
  - Osmoregulation
    - 82-002362
  - Salinity
    - 82-002362
  - Tank Culture
    - 82-000014
- Moxostoma anisurum
  - Parasites/Diseases
    - 82-002774
  - Trematodes
    - 82-002774
- Moxostoma erythrurum
  - Age/Growth
    - 82-001681
  - Condition Factors
    - 82-001681
- Mugil auratus
  - Endocrinology
    - 82-001445
  - Life History/General
    - 82-002442
  - Reproduction
    - 82-001445
    - 82-002442
- Mugil capito
  - Catecholamines
    - 82-000720
  - Endocrinology
    - 82-000661
  - Osmoregulation
    - 82-000661
    - 82-000720
- Mugil cephalus
  - Age/Growth
    - 82-000286
  - Blood Chemistry
    - 82-000647

## SYSTEMATIC INDEX

...CONTINUED...

- Mugil cephalus
  - Cadmium
    - 82-001144
  - Distribution/Geographical
    - 82-001725
  - Endocrinology
    - 82-001445
    - 82-002215
  - Ergasilus
    - 82-001851
  - Gill Parasites
    - 82-001851
  - Heavy Metals
    - 82-001144
  - Life History/General
    - 82-001604
  - Management/Research--Lakes
    - 82-002007
    - 82-002978
  - Management/Research--Marine
    - 82-001604
  - Movements
    - 82-000286
  - Osmoregulation
    - 82-000715
  - Parasites/Diseases
    - 82-001851
  - Parasitic Copepods
    - .82-001851
  - Population Studies
    - 82-001604
  - Reproduction
    - 82-001445
  - Respiration
    - 82-000647
  - Temperature
    - 82-000647
- Mugil curema
  - Life History/General
    - 82-002451
- Mugil liza
  - Spawning
    - 82-000237
- Mugil seheli
  - Commercial Fishing
    - 82-003009
  - Culture/Propagation
    - 82-003009
  - Management/Research--Marine
    - 82-003009
- Mugilidae
  - Identification
    - 82-000997
- Mullur barbatus
  - Heavy Metals
    - 82-002801
- Mullus barbatus
  - Age/Growth
    - 82-001687

...CONTINUED...

- Mullus barbatus
  - Carotenoids
    - 82-001396
  - Maturation
    - 82-001687
  - Mercury
    - 82-002801
  - Selenium
    - 82-002801
  - Sewage Effluents
    - 82-002819
- Mullus barbatus ponticus
  - Blood Chemistry
    - 82-002224
  - Exercise
    - 82-002224
- Muraenesox cinereus
  - Foods/Feeding
    - 82-002539
- Muraenesox talabonoides
  - Regeneration
    - 82-002266
- Muraenidae
  - Misc. Behavior
    - 82-000803
  - Taxonomy
    - 82-001761
- Mustelus canis
  - Blood Chemistry
    - 82-000718
    - 82-002222
  - Cardio-Vascular System
    - 82-000718
- Mustelus griseus
  - Embryology
    - 82-000077
- Myctophidae
  - Population Studies
    - 82-000223
  - Taxonomy
    - 82-001016
- Myliobatis chilensis
  - Acanthobothrium
    - 82-002762
  - Cestodes
    - 82-002762
  - Parasites/Diseases
    - 82-002762
- Myoxocephalus octodecimspinosus
  - Oil
    - 82-001914
  - Osmoregulation
    - 82-001395
- Myoxocephalus scorpius
  - Antifreeze Production
    - 82-002262
- Myripristis hexagonus
  - Taxonomy
    - 82-001020

...CONTINUED...
Myripristis murdjan
  Taxonomy
    82-001020
Mystus seenghala
  Culture/Propagation
    82-000022
  Fingerling Production
    82-000022
Myxine glutinosa
  Endocrinology
    82-002257
    82-002258
  Reproduction
    82-002504
  Spawning
    82-002504
  Starvation
    82-002257
Nannocharax maculicauda
  New Species
    82-000360
Nannostomus beckfordi
  Aggressive Behavior
    82-000808
  Spawning
    82-000808
  Territorial Behavior
    82-000808
Naucrates ductor
  Distribution/Geographical
    82-000321
Neenchelys daedalus
  New Species
    82-002697
Negaprion acutidens
  Cleaning Behavior
    82-000807
Negaprion brevirostris
  Auditory Senses
    82-000794
  Bioenergetics
    82-000673
  Blood Chemistry
    82-002231
  Cleaning Behavior
    82-000807
  Dermophthirius
    82-001064
  Exercise
    82-002064
    82-002231
  Foods/Feeding
    82-000924
  Metabolic Rates
    82-000673
  Parasites/Diseases
    82-001064
  Predator/Prey Relationships
    82-000673

...CONTINUED...
Negaprion brevirostris
  Trematodes
    82-001064
  Vision
    82-000805
Nemachilus longianalis
  New Subspecies
    82-001719
Nemadactylus macropterus
  Age/Growth
    82-001696
Nemamyxine kreffti
  New Species
    82-001762
Nemipterus japonicus
  Fecundity
    82-002487
  Spawning
    82-002487
Nemipterus mesoprion
  Distribution/Geographical
    82-002640
Neoceratodus forsteri
  Culture/Propagation
    82-000018
  Digestive System
    82-000071
Neoditrema ransonneti
  Competition
    82-000804
  Habitat Selection
    82-000804
Neophrynichthys marmoratus
  Distribution/Geographical
    82-000323
Nezumia bairdii
  Diclidophora nezumiae
    82-000387
  Parasites/Diseases
    82-000387
  Trematodes
    82-000387
Noemacheilus barbatulus
  Age/Growth
    82-002596
  Foods/Feeding
    82-002545
  Population Studies
    82-002596
Notemigomus crysoleucas
  Anesthetics
    82-001920
  Etomidate
    82-001920
Notemigonus crysoleucas
  Culture/Propagation
    82-000416
  Golden Shiner Virus
    82-002748

## SYSTEMATIC INDEX

...CONTINUED...
- Notemigonus crysoleucas
  - Heavy Metals
    - 82-000416
  - Parasites/Diseases
    - 82-002748
  - Sewage Effluents
    - 82-000404
    - 82-000416
  - Viral Diseases
    - 82-002748
- Notopterus chitala
  - Auditory Senses
    - 82-001553
- Notopterus notopterus
  - Heavy Metals
    - 82-000418
- Nototheniidae
  - Buoyancy Adjustment
    - 82-001556
  - Reproduction
    - 82-002506
- Notropis albeolus
  - Habitat Selection
    - 00-000000
  - Life History/General
    - 00-000000
- Notropis ardens
  - Habitat Selection
    - 00-000000
  - Life History/General
    - 00-000000
- Notropis bocagrande
  - New Species
    - 82-002675
- Notropis boops X N. chrysocephalus
  - Hybridization
    - 82-002386
- Notropis buchanani
  - Distribution/Geographical
    - 82-000975
- Notropis callitaenia
  - Hybridization
    - 82-000786
- Notropis cerasinus
  - Habitat Selection
    - 00-000000
  - Life History/General
    - 00-000000
- Notropis cornutus
  - Eimeria
    - 82-001817
  - Parasites/Diseases
    - 82-001817
  - Protozoan Diseases
    - 82-001817
  - Schooling Behavior
    - 82-000161
  - Variation Studies
    - 82-000161
- Notropis cornutus chrysocephalus
  - Distribution/Geographical
    - 82-000981
- Notropis formosus
  - Taxonomy
    - 82-002675
- Notropis lutrensis
  - Flow Regimes
    - 82-000798
  - Hybridization
    - 82-000786
  - Sewage Effluents
    - 82-000404
  - Temperature
    - 82-000798
  - Temperature Selection
    - 82-000798
- Notropis lutrensis x N. callitaenia
  - Hybridization
    - 82-000786
- Notropis photogenis
  - Distribution/Geographical
    - 82-001595
  - Life History/General
    - 82-001595
  - Status
    - 82-001595
- Notropis rubricroceus
  - Distribution/Geographical
    - 82-000981
- Notropis simus
  - Taxonomy
    - 82-001002
- Notropis spectrunculus
  - Distribution/Geographical
    - 82-000981
- Notropis umbratilis
  - Distribution/Geographical
    - 82-000975
- Notropis venustus
  - Temperature
    - 82-000177
  - Temperature Selection
    - 82-000177
- Noturus miurus
  - Life History/General
    - 82-000832
- Odontogadu meriangus euxinus
  - Metabolic Rates
    - 82-000113
- Odontostomops normalops
  - Early Development
    - 82-002127
- Omobranchini
  - Taxonomy
    - 82-000358
- Omobranchus robertsi
  - New Species
    - 82-000358

...CONTINUED...

Omox lupus
  New Species
    82-000358
Ompok bimaculatus
  Endocrinology
    82-001418
  Nervous System
    82-001418
Oncorhynchus
  Abundance/Factors of
    82-000993
  Age/Growth
    82-001252
  Age/Length Composition
    82-001252
  Aquariums
    82-002102
  Culture/Propagation
    82-000517
    82-002102
    82-002944
  Fish Stocks
    82-001248
  Genetic Strains
    82-000517
  Limited Entry
    82-001971
  Management/Research--General
    82-001944
    82-001948
    82-002889
    82-002944
  Management/Research--Rivers and Streams
    82-001248
    82-001252
  Marking/Tagging
    82-001975
    82-001976
  Movements
    82-001641
  Nursery Areas
    82-000839
  Regulations
    82-001971
  Stocking/Introductions
    82-000517
    82-002944
  Supplemental Stocking
    82-000517
  Wire Taggs
    82-001976
Oncorhynchus gorbuscha
  Culture/Propagation
    82-001535
  Distribution/Geographical
    82-001735
  Harvest
    82-002915

...CONTINUED...
Oncorhynchus gorbuscha
  Hybridization
    82-001535
  Life History/General
    82-002426
  Salinity
    82-000102
  Spawning
    82-000240
    82-002426
  Spawning Migration
    82-002915
Oncorhynchus keta
  Abundance/Factors of
    82-002967
  Bacterial Diseases
    82-001801
  Culture/Propagation
    82-001284
    82-001315
    82-001316
    82-001331
  Diets
    82-001316
  Electrophoresis
    82-001525
  Fecundity
    82-001624
  Feeding Experiments
    82-001315
    82-001316
  Fish Stocks
    82-001619
  Genetics
    82-002387
  Heavy Metals
    82-000435
  Mercury
    82-000435
  Mortality Factors
    82-002661
  Mortality Rates
    82-002661
  Movements
    82-001640
  Nutrition
    82-001315
  Ocean Ranching
    82-001284
  Osmoregulation
    82-001431
  Parasites/Diseases
    82-001801
  Population Studies
    82-002967
  Salinity
    82-001431
  Spawning
    82-002418

...CONTINUED...
Oncorhynchus keta
  Stocking/Introductions
    82-001640
  Transportation
    82-001331
  Variation Studies
    82-001525
  Vibriosis
    82-001801
  Vitamins
    82-001315
Oncorhynchus kisutch
  Age/Length Composition
    82-000948
  Aroclor 1254
    82-001905
  Asbestos
    82-001115
  Bacterial Diseases
    82-001043
    82-001800
  Bayer 73
    82-002868
  Blood Chemistry
    82-000736
  Botulism
    82-001043
  Clostridium botulinum
    82-001043
  Competition
    82-001651
  Copper
    82-001897
    82-001923
  Corticosteroids
    82-000736
  Culture/Propagation
    82-000007
    82-000008
    82-000009
    82-000516
    82-001285
    82-002092
  Diets
    82-002092
  Endocrinology
    82-001505
    82-002301
    82-002367
  Excretory System
    82-000630
  Fecundity
    82-001624
  Feeding Experiments
    82-002092
  Fish Stocks
    82-002381
  Foods/Feeding
    82-000269

...CONTINUED...
Oncorhynchus kisutch
  Foods/Feeding
    82-001651
  Gynogenesis
    82-002385
  Heavy Metals
    82-000435
    82-001897
    82-001923
  Hormones
    82-001505
  Immunization
    82-001800
  Induced Maturation
    82-000007
    82-000008
    82-000009
    82-001285
    82-001504
  Lake Culture
    82-000516
  Length-Weight Relationships
    82-000948
  Life History/General
    82-002436
  Management/Research--Marine
    82-002036
  Marking/Tagging
    82-001188
  Maturation
    82-002367
  Mercury
    82-000435
  Mortality Rates
    82-002436
  Movements
    82-001637
    82-002525
  Oil
    82-001905
  Organochlorines
    82-001917
  Osmoregulation
    82-002239
  Parasites/Diseases
    82-001043
    82-001800
    82-002719
  Parr-Smolt Transformation
    82-002239
  Piscicides
    82-002868
  Polychlorinated Biphenyls
    82-001873
    82-001905
  Population Studies
    82-000948
  Production
    82-002459
  Reproduction
    82-001505

## SYSTEMATIC INDEX

...CONTINUED...
- Oncorhynchus kisutch
  - Reproduction
    - 82-002301
    - 82-002367
  - Sex Determination
    - 82-001533
  - Starvation
    - 82-002302
  - Stocking/Introductions
    - 82-001980
    - 82-001981
    - 82-001981
  - Strontium
    - 82-001188
  - Territorial Behavior
    - 82-000269
  - Unisex Populations
    - 82-002385
  - Variation Studies
    - 82-002381
  - Yersinia ruckeri
    - 82-001800
- Oncorhynchus masou
  - Fish Preservation
    - 82-003031
  - Movements
    - 82-002529
  - Myxidium
    - 82-002737
  - Parasites/Diseases
    - 82-002737
    - 82-002753
  - Pheromones
    - 82-000880
  - Protozoan Diseases
    - 82-002737
  - Sex Reversal
    - 82-000711
  - Spawning
    - 82-000251
    - 82-000880
  - Tetraonchus
    - 82-002753
  - Trematodes
    - 82-002753
- Oncorhynchus nerka
  - Age/Growth
    - 82-001689
    - 82-002610
  - Artificial Spawning Beds
    - 82-002901
  - Competition
    - 82-000917
  - Excretory System
    - 82-002308
  - Fertilization/Soil and Water
    - 82-000476
  - Fish Stocks
    - 82-001359

...CONTINUED...
- Oncorhynchus nerka
  - Fish Stocks
    - 82-002205
  - Foods/Feeding
    - 82-000917
    - 82-000937
  - Herbicides
    - 82-000429
  - IHN
    - 82-001826
    - 82-002744
  - Lipid Composition
    - 82-002328
  - Management/Research--Reservoirs
    - 82-002901
  - Meristic Studies
    - 82-001359
  - Nursery Lakes
    - 82-000476
  - Orientation/Homing
    - 82-001579
  - Otoliths
    - 82-001371
    - 82-002610
  - Parasites/Diseases
    - 82-000390
    - 82-001826
    - 82-002744
  - Parasitic Copepods
    - 82-000390
  - Population Studies
    - 82-000228
    - 82-000498
    - 82-001222
    - 82-002975
  - Predator/Prey Relationships
    - 82-000937
  - Salmincola californiensis
    - 82-000390
  - Scales
    - 82-002129
    - 82-002205
  - Viral Diseases
    - 82-001826
    - 82-002744
  - 2,4-D
    - 82-000429
- Oncorhynchus rhodurus
  - Endocrinology
    - 82-000708
    - 82-001437
    - 82-001521
    - 82-002286
  - Pheromones
    - 82-000880
  - Reproduction
    - 82-000154
    - 82-000708
    - 82-001437
    - 82-001521
  - Spawning
    - 82-000880

# SYSTEMATIC INDEX

...CONTINUED...

- Oncorhynchus rhodurus
  - Steroids
    - 82-000154
    - 82-000708
- Oncorhynchus tshawytscha
  - Age/Growth
    - 82-002595
  - Amino Acids
    - 82-000006
  - Cadmium
    - 82-002833
  - Copper
    - 82-002833
  - Culture/Propagation
    - 82-000006
    - 82-000521
    - 82-002085
  - Diets
    - 82-002085
  - Early Development
    - 82-000679
  - Egg Survival
    - 82-002659
  - Embryology
    - 82-002659
  - Feeding Experiments
    - 82-002085
  - Fertilization/Soil and Water
    - 82-000006
  - Growth Stimulants
    - 82-000521
  - Heavy Metals
    - 82-002833
  - IHP
    - 82-001059
  - Management/Research--Marine
    - 82-002036
  - Movements
    - 82-000264
  - Nutrition
    - 82-000006
  - Orientation/Homing
    - 82-000827
  - Parasites/Diseases
    - 82-001059
    - 82-002719
  - Polychlorinated Biphenyls
    - 82-001873
  - Population Studies
    - 82-001617
  - Restoration of Anadromous Runs
    - 82-000486
  - Size at Release
    - 82-001202
  - Spawning Migration
    - 82-000827
  - Stocking/Introductions
    - 82-001202
  - Temperature
    - 82-000679

...CONTINUED...

- Oncorhynchus tshawytscha
  - Viral Diseases
    - 82-001059
  - Volcanic Ash
    - 82-000827
  - Zinc
    - 82-002833
- Ophichthidae
  - Misc. Behavior
    - 82-000803
- Ophidiidae
  - Distribution/Geographical
    - 82-000303
- Ophidiiformes
  - Swimbladder
    - 82-000595
- Ophiocephalus maculatus
  - Osmoregulation
    - 82-000753
  - Salinity
    - 82-000753
- Ophiocephalus punctatus
  - Digestive System
    - 82-000670
- Opisthonema
  - Management/Research--Marine
    - 82-001270
  - Yield
    - 82-001270
- Oplegnathus fasciatus
  - Insecticides
    - 82-001932
  - Organophosphates
    - 82-001932
- Opsanus beta
  - Osmoregulation
    - 82-000650
    - 82-001395
    - 82-001407
  - pH Regulation
    - 82-001407
- Opsanus tau
  - Activity Patterns
    - 82-000195
  - Age/Growth
    - 82-001701
  - Blood Chemistry
    - 82-001448
  - Enzymes
    - 82-000132
  - Foods/Feeding
    - 82-001701
  - Osmoregulation
    - 82-001448
  - Protein Synthesis
    - 82-000677
  - Swimbladder
    - 82-000132
  - Temperature
    - 82-000677

...CONTINUED...

Orthodon microlepidotus
  Hypoxia
    82-000089
  Respiration
    82-000089
Oryzias latipes
  Cadmium
    82-000430
  Embryology
    82-000135
    82-001409
  Enzymes
    82-001409
  Flame Retardants
    82-001931
  Heavy Metals
    82-000430
  Phophoric Acid Triesters
    82-001931
  Phosphates
    82-000439
Osmerus
  Taxonomy
    82-002695
Osmerus eperlanus
  Maturation
    82-002495
Osmerus mordax
  Age/Growth
    82-001693
    82-002468
  Distribution/Geographical
    82-001704
  Fish Stocks
    82-002468
  Foods/Feeding
    82-002536
  Heavy Metals
    82-002837
  Impingement/Entrainment
    82-001218
  Lead
    82-002837
  Mortality Rates
    82-001693
    82-002468
  Parasites/Diseases
    82-001832
  Piscine Erythrocytic Necrosis
    82-001832
  Population Studies
    82-001611
  Power Plants
    82-001218
  Predator/Prey Relationships
    82-000282
    82-002536
  Trophic Relationships
    82-002536

...CONTINUED...
Osmerus mordax
  Viral Diseases
    82-001832
Ostariophysi
  Enzymes
    82-002249
Osteochilus pentalineatus
  New Species
    82-002692
Osteoglossum bicirrhosum
  Endocrinology
    82-000888
  Reproduction
    82-000888
  Spawning
    82-000888
Otolithes argenteus
  Foods/Feeding
    82-002425
  Length-Weight Relationships
    82-002425
  Spawning
    82-002425
Otolithes ruber
  Foods/Feeding
    82-002560
Oxyeleotris marmoratus
  Henneguya shaharini
    82-001054
  Parasites/Diseases
    82-001054
  Protozoan Diseases
    82-001054
Pagrus major
  Blood Chemistry
    82-001430
  Culture/Propagation
    82-000023
    82-002095
  Feeders
    82-002095
  Lordosis
    82-000696
  Oxygen
    82-001430
  Swimbladder
    82-000696
Palaeonisciformes
  Taxonomy
    82-002690
Pampus argenteus
  Foods/Feeding
    82-002425
  Length-Weight Relationships
    82-002425
  Spawning
    82-002425
Pampus chinensis
  Maturation
    82-002503

# SYSTEMATIC INDEX

...CONTINUED...

- Pampuc chinensis
  - Spawning
    - 82-002503
- Pangasius sutchi
  - Culture/Propagation
    - 82-000574
  - Gamete Storage
    - 82-000574
- Pantosteus clarki
  - Foods/Feeding
    - 82-002566
- Papeliochromis
  - Taxonomy
    - 82-001022
- Papichthys mongoliensis
  - Paleontology
    - 82-001770
- Paracilurus asotus
  - Digestive System
    - 82-000756
  - Enzymes
    - 82-000757
  - Hormones
    - 82-000756
  - Pancreas
    - 82-000757
- Parakumba
  - New Genus
    - 82-002710
- Parakumba maculisquama
  - New Species
    - 82-002710
- Paralichthys albigutta
  - Predator/Prey Relationships
    - 82-001643
- Paralichthys dentatus
  - Bibliographies
    - 82-001277
  - Digestion Rates
    - 82-000645
  - Digestive System
    - 82-000645
  - Life History/General
    - 82-001277
  - Management/Research--Marine
    - 82-001277
  - Movements
    - 82-000896
  - Nitrogen Metabolism
    - 82-000645
- Paraliparis rosaceus
  - Distribution/Geographical
    - 82-000322
- Parapercis albogutta
  - Distribution/Geographical
    - 82-002643
- Paraplagusia japonica
  - Life History/General
    - 82-002407
- Parapristipoma trilineatum
  - Foods/Feeding
    - 82-000921
- Parasilurus asotus
  - Barbels
    - 82-001358
  - Coloration
    - 82-000606
  - Taste Reception
    - 82-001358
- Parophrys vetulus
  - Age/Growth
    - 82-000954
    - 82-002592
    - 82-002601
  - Aromatic Hydrocarbons
    - 82-001134
    - 82-002861
  - Blood Chemistry
    - 82-001462
  - Enzymes
    - 82-002234
  - Foods/Feeding
    - 82-001654
  - Glugea stephani
    - 82-000376
  - Naphthalene
    - 82-001134
  - Parasites/Diseases
    - 82-000376
  - Predator/Prey Relationships
    - 82-001654
  - Protozoan Diseases
    - 82-000376
  - Upwelling
    - 82-000954
- Parosphromenus filamentosus
  - New Species
    - 82-000361
- Parupeneus porphyreus
  - Camouflage
    - 82-001564
  - Coloration
    - 82-001564
- Pectenocypris
  - New Genus
    - 82-002692
- Pectenocypris korthausae
  - New Species
    - 82-002692
- Pennahia aneus
  - Meristic Studies
    - 82-002160
- Peocilia chica
  - Pheromones
    - 82-000796
- Peocilia reticulata
  - Sex Determination
    - 82-000771

...CONTINUED...

Peociliopsis occidentalis
Distribution/Geographical
82-001718
Peociliopsis occidentalis occidentalis
Floods
82-000327
Status
82-000327
Perca flavescens
Abundance
82-001618
Acid Precipitation
82-000413
Age/Growth
82-000413
82-001695
Biomagnification
82-001875
82-002816
Culture/Propagation
82-002816
Electrophoresis
82-000777
Endocrinology
82-000745
Enzymes
82-001420
Fish Passage
82-002965
Foods/Feeding
82-001665
Foods/Feeding/Selectivity
82-000922
Gill Parasites
82-000382
Heavy Metals
82-002813
Impingement/Entrainment
82-001218
82-002965
Life History/General
82-002449
Manganese
82-001875
Mercury
82-002813
Parasites/Diseases
82-000382
82-000383
pH
82-002846
Polychlorinated Biphenyls
82-002816
Population Studies
82-001618
Power Plant Effluents
82-001875
Power Plants
82-001218

...CONTINUED...
Perca flavescens
Power Plants
82-002965
Predator/Prey Relationships
82-000922
Radionuclides
82-001875
Spawning
82-002449
Steroids
82-000745
Temperature Selection
82-000820
Thermal Pollution
82-000820
Trematodes
82-000382
82-000383
Trophic Relationships
82-001665
Urocleidus adspectus
82-000382
82-000383
Variation Studies
82-000777
Perca fluviatilis
Bacterial Diseases
82-000370
Bioenergetics
82-002295
Cadmium
82-002787
Digestive System
82-000714
Eutrophication
82-001090
Fecundity
82-002514
Foods/Feeding
82-000270
Heavy Metals
82-002787
Lead
82-002787
Nets/Netting
82-001985
Parasites/Diseases
82-000370
Population Studies
82-001622
Reproductive System
82-000059
82-000714
Temperature
82-000700
Vision
82-001366
Zinc
82-002787
Percina maculata x P. caprodes
Hybridization
82-000770

# SYSTEMATIC INDEX

...CONTINUED...

- Percina nigrofasciata
  - Chemoreception
    - 82-001581
  - Fright Behavior
    - 82-001581
- Periophthalmus koelreuteri
  - Digestive System
    - 82-002250
  - Enzymes
    - 82-002250
  - Excretory System
    - 82-002192
  - Head Kidney
    - 82-002192
- Peristediidae
  - Taxonomy
    - 82-001758
- Petromyzon marinus
  - Blood Chemistry
    - 82-002260
  - Digestive System
    - 82-000758
    - 82-000759
  - Electrophoresis
    - 82-000764
    - 82-000775
    - 82-002260
  - Endocrinology
    - 82-000695
    - 82-001391
    - 82-002289
  - Excretory System
    - 82-002211
    - 82-002212
  - Fish Control/Removal
    - 82-000459
  - Fish Stocks
    - 82-000764
    - 82-000775
  - Foods/Feeding
    - 82-002555
  - Genetic Strains
    - 82-000764
  - Hormones
    - 82-001391
    - 82-002289
  - Management/Research--Lakes
    - 82-000775
  - Metamorphosis
    - 82-000091
    - 82-000758
    - 82-002143
  - Organochlorines
    - 82-001874
  - Osmoregulation
    - 82-002212
  - Osmregulation
    - 82-002211

...CONTINUED...

- Petromyzon marinus
  - Pineal Body
    - 82-002135
  - Skeletal System
    - 82-002207
  - Sterilization
    - 82-000459
  - Variation Studies
    - 82-000775
  - Vision
    - 82-002143
- Petromyzonidae
  - Fish Lists/Keys
    - 82-002708
  - Taxonomy
    - 82-001773
- Petroscirtes variabilis
  - Foods/Feeding
    - 82-001677
  - Sexual Dimorphism
    - 82-001677
- Petrotilapia
  - Distribution/Vertical
    - 82-000260
  - Electrophoresis
    - 82-002699
  - Hydrostatic Pressure
    - 82-000260
  - Taxonomy
    - 82-002699
- Phalloceros caudimaculatus
  - Electrophoresis
    - 82-001027
  - Identification
    - 82-001027
  - Morphology
    - 82-001027
- Pholis ornata
  - Habitat Selection
    - 82-000792
- Photoblepharon palpebratus
  - Vision
    - 82-002173
- Phoxinus eos X P. neogaeus
  - Hybridization
    - 82-001534
- Phoxinus phoxinus
  - Diplostomum phoxini
    - 82-001061
  - Early Development
    - 82-002196
  - Embryology
    - 82-002196
  - Parasites/Diseases
    - 82-001061
  - Rheotropism
    - 82-001577
  - Spawning
    - 82-002196

...CONTINUED...
Phoxinus phoxinus
  Trematodes
    82-001061
Pimelodus maculatus
  Cadmium
    82-002828
  Heavy Metals
    82-002828
  Histology
    82-002148
  Liver
    82-000049
Pimephales notatus
  Musculature
    82-002269
  Skeletal System
    82-002141
  Variation Studies
    82-002141
Pimephales promelas
  Air Breathing
    82-000697
  Anesthetics
    82-002858
  Benzene
    82-001901
  Bioassay Techniques
    82-001114
  Cnidospora
    82-000373
  Coal Conversion Effluents
    82-001114
  Culture/Propagation
    82-000416
  Eimeria
    82-001817
  Escape Behavior
    82-001588
  Fecundity
    82-000877
  Heavy Metals
    82-000416
    82-002845
  MS-222
    82-002858
  Naphthalene
    82-001901
  Parasites/Diseaes
    82-001081
  Parasites/Diseases
    82-000373
    82-001817
  Phenols
    82-001120
  Posthodiplostomum minimum minimun
    82-001081
  Protozoan Diseases
    82-000373
    82-001817

...CONTINUED...
Pimephales promelas
  Pugheadedness
    82-000592
  Respiration
    82-000697
  Sewage Effluents
    82-000404
    82-000416
  Silver
    82-002845
  Spawning
    82-000877
  Toluene
    82-001902
  Trematodes
    82-001081
Pimephales vigilax
  Skeletal System
    82-002141
  Variation Studies
    82-002141
Plagopterus argentissimus
  Flow Regimes
    82-000988
Platichthys flesus
  Biomagnification
    82-001937
  Copper
    82-001937
  Heavy Metals
    82-001937
  Hypoxia
    82-000739
  Lipid Metabolism
    82-000105
  Metabolic Rates
    82-002255
  Temperature
    82-000105
    82-002255
  Variation Studies
    82-002380
Platichthys flesus luscus
  Oil Dispersants
    82-002847
Platichthys stellatus
  Age/Growth
    82-002578
  Anemia
    82-000754
  Blood Chemistry
    82-000754
  Metamorphosis
    82-001481
  Parasites/Diseases
    82-000754
Platycephalus bassensis
  Heavy Metals
    82-002820

## SYSTEMATIC INDEX

...CONTINUED...
- Platycephalus bassensis
  - Mercury
    - 82-002820
- Platycephalus caeruleopunctatus
  - Heavy Metals
    - 82-002820
  - Mercury
    - 82-002820
- Platytroctidae
  - Taxonomy
    - 82-000356
- Plecoglossus altivelis
  - Bacterial Diseases
    - 82-000369
    - 82-000372
    - 82-001046
  - Culture/Propagation
    - 82-001318
  - Feeding Experiments
    - 82-001318
  - Feeds
    - 82-001318
  - Hormones
    - 82-000153
  - Life History/General
    - 82-000207
  - Nutrition
    - 82-001318
  - Parasites/Diseases
    - 82-000369
    - 82-000372
    - 82-001046
  - Reproduction
    - 82-000153
  - Streptococcus
    - 82-000369
    - 82-000372
    - 82-001046
  - Taxonomy
    - 82-000207
  - Vibrio anguillarum
    - 82-000369
- Plecoglosus altivelis
  - Vibriosis
    - 82-001046
- Plectroglyphidodon johnstonianus
  - Social Behavior
    - 82-001630
  - Spawning
    - 82-001630
- Pleurogrammus monopterygius
  - Sexual Dimorphism
    - 82-002213
- Pleuronectes platessa
  - Activity Patterns
    - 82-002398
  - Age/Growth
    - 82-001317
  - Amino Acids
    - 82-000130

...CONTINUED...
- Pleuronectes platessa
  - Biomagnification
    - 82-002803
  - Blood Chemistry
    - 82-002365
  - Copper
    - 82-002356
  - Culture/Propagation
    - 82-001317
  - Electrophoresis
    - 82-001373
  - Enzymes
    - 82-001373
  - Feeding Experiments
    - 82-001317
  - Gynogenesis
    - 82-000782
  - Healing
    - 82-000681
  - Heavy Metals
    - 82-002803
  - Hormones
    - 82-002365
  - Hydrostatic Pressure
    - 82-002398
  - Hypoxia
    - 82-000739
  - Liver
    - 82-002202
  - Metabolic Rates
    - 82-001434
  - Metabolism
    - 82-000130
  - Oil
    - 82-002797
  - Variation Studies
    - 82-001373
  - Zinc
    - 82-002803
- Pleuronectes platessa x Platichthys flesus
  - Hybridization
    - 82-000166
  - Maturation
    - 82-000166
  - Triploid Fish
    - 82-000166
- Pleuronectes yokohamae
  - Abundance/Factors of
    - 82-001742
  - Life History/General
    - 82-001742
- Pleuronectidae
  - BAP
    - 82-001121
  - Oil
    - 82-001121
- Pleuronichthys cornutus
  - Life History/General
    - 82-001596

...CONTINUED...

Poecilia
  Behavior
   82-000795
  Cannibalism
   82-002404
  Character Displacement
   82-002188
  Genetics
   82-000795
  Meristic Studies
   82-002188
  Pheromones
   82-000795
  Variation Studies
   82-002188
Poecilia formosa
  Aromatic Hydrocarbons
   82-001941
  Triploid Fish
   82-002384
  Unisex Populations
   82-002384
Poecilia latipinna
  Age/Growth
   82-001697
  Endocrinology
   82-002210
  Reproductive System
   82-002210
Poecilia reticulata
  Air Breathing
   82-000116
  Cadmium
   82-002836
  Coloration
   82-001367
  Copper
   82-000442
  Gyrodactylus bullatarudis
   82-002781
  Heavy Metals
   82-000442
   82-002836
  Hypoxia
   82-000116
  Lipid Composition
   82-002247
  Lipid Metabolism
   82-002247
  Parasites/Diseases
   82-002781
  Phenols
   82-000437
   82-001117
  Pheromones
   82-001463
  Population Studies
   82-002458

...CONTINUED...
Poecilia reticulata
  Spawning
   82-000249
  Temperature
   82-000249
  Trematodes
   82-002781
  Trimethylphosphate
   82-001119
Poeciliidae
  Aromatic Hydrocarbons
   82-002865
Poeciliopsis
  DMBA
   82-001136
  Status
   82-001162
Poeciliopsis knilickai
  New Species
   82-000347
Poeciliopsis occidentalis occidentalis
  Floods
   82-000987
Pollimyrus isidori
  Electric Organs
   82-000750
Polyipnus inermis
  New Species
   82-002672
Polyodon spathula
  Blindness
   82-001084
  Caudal Neurosecretory System
   82-001390
  Electroreception
   82-001415
  Exploitation Rates
   82-000845
  Life History/General
   82-000845
  Mortality Rates
   82-000845
  Parasites/Diseases
   82-001084
  Population Studies
   82-000845
  Variation Studies
   82-002374
Polypterus
  Scales
   82-002171
  Skeletal System
   82-002171
Polypterus bichir
  Embryology
   82-000613
Pomacentrus bankanensis
  Territorial Behavior
   82-000818

# SYSTEMATIC INDEX

...CONTINUED...

- Pomacentrus partitus
  - Anilocra
    - 82-000391
  - Parasites/Diseases
    - 82-000391
  - Parasitic Isopods
    - 82-000391
- Pomadasys
  - Taxonomy
    - 82-001013
- Pomadasys argenteus
  - Foods/Feeding
    - 82-002425
  - Length-Weight Relationships
    - 82-002425
  - Spawning
    - 82-002425
- Pomadasys hasta
  - Nematodes
    - 82-002778
  - Parasites/Diseases
    - 82-002778
- Pomatomus saltatrix
  - Blood Chemistry
    - 82-000123
    - 82-000718
  - Cardio-Vascular System
    - 82-000718
  - Reproduction
    - 82-000123
  - Swimming Performance
    - 82-001576
- Pomatoschistus bathi
  - New Species
    - 82-002701
- Pomatoschistus microps
  - Foods/Feeding/Selectivity
    - 82-002554
  - Habitat Selection
    - 82-002554
- Pomatoschistus minutus
  - Foods/Feeding/Selectivity
    - 82-002554
  - Habitat Selection
    - 82-002554
- Pomatoschistus norvegicus
  - Life History/General
    - 82-000212
- Pomatoschistus tortonesei
  - Taxonomy
    - 82-002701
- Pomoxis annularis
  - Age/Growth
    - 82-001594
  - Foods/Feeding
    - 82-001594
    - 82-002573
  - Foods/Feeding/Selectivity
    - 82-000942

...CONTINUED...

- Pomoxis annularis
  - Management/Research--Reservoirs
    - 82-001594
  - Population Studies
    - 82-001594
  - Predator/Prey Relationships
    - 82-002573
- Porichthys notatus
  - Age/Growth
    - 82-000208
  - Foods/Feeding
    - 82-000208
- Potamotrygon circularis
  - Paraheteronchocotyle amazonensis
    - 82-000386
  - Parasites/Diseases
    - 82-000386
  - Potamotrygonocotyle tsalickisi
    - 82-000386
  - Trematodes
    - 82-000386
- Prionotus carolinus
  - Fins
    - 82-002149
  - Nervous System
    - 82-002149
- Pristis perotteti
  - Exploitation Rates
    - 82-002011
  - Harvest
    - 82-002011
  - Life History/General
    - 82-001603
  - Management/Research--Lakes
    - 82-002011
  - Osmoregulation
    - 82-002317
  - Population Studies
    - 82-002011
- Promicrops lanceolatus
  - Foods/Feeding
    - 82-000284
  - Predator/Prey Relationships
    - 82-000284
- Prosopium cylindraceum
  - Life History/General
    - 82-002430
- Protopterus aethiopicus
  - Musculature
    - 82-000046
- Protopterus annectens brieni
  - Distribution/Geographical
    - 82-001723
- Prototroctes maraena
  - Biochemical Composition
    - 82-000638
- Psettodes erumei
  - Foods/Feeding
    - 82-002422

...CONTINUED...

- Psettodes erumei
  - Harvest
    - 82-002422
  - Life History/General
    - 82-002422
- Pseudoapistogramma
  - Taxonomy
    - 82-001022
- Pseudogeophagus
  - Taxonomy
    - 82-001022
- Pseudojuloides
  - Taxonomy
    - 82-000353
- Pseudophoxinus persidis
  - New Species
    - 82-000339
- Pseudophycis bacchus
  - Bothriocephalus scorpii
    - 82-002773
  - Cestodes
    - 82-002773
  - Parasites/Diseases
    - 82-002773
- Pseudophycis bachus
  - Biochemical Composition
    - 82-002360
  - Lipid Content
    - 82-002360
- Pseudopleuronectes americanus
  - Activity Patterns
    - 82-000799
  - Antifreeze Production
    - 82-002333
  - Culture/Propagation
    - 82-001309
    - 82-002091
  - Digestion Rates
    - 82-000688
    - 82-001453
  - Excretory System
    - 82-000729
    - 82-001483
  - Feeding Experiments
    - 82-002091
  - Feeds
    - 82-002091
  - Glugea stephani
    - 82-001056
  - Gyrodactylus pleuronecti
    - 82-001066
  - Heated Water
    - 82-001309
  - Hormones
    - 82-000665
  - Osmoregulation
    - 82-001485
  - Parasites/Diseases
    - 82-001056

...CONTINUED...

- Pseudopleuronectes americanus
  - Parasites/Diseases
    - 82-001066
  - Protozoan Diseases
    - 82-001056
  - Taurine
    - 82-000729
  - Temperature
    - 82-000799
  - Temperature Selection
    - 82-000799
  - Trematodes
    - 82-001066
  - Vision
    - 82-001580
- Pseudosciaena diacanthus
  - Harvest
    - 82-002923
- Psychrolutes phrictus
  - Distribution/Geographical
    - 82-000322
- Psychrolutidae
  - Taxonomy
    - 82-001763
- Pteichocheilus lucius
  - Cestodes
    - 82-002776
  - Ophiotaenia critica
    - 82-002776
  - Parasites/Diseases
    - 82-002776
- Pterophyllum eimekei
  - Locomotion
    - 82-000179
- Ptychocheilus
  - Competition
    - 82-002535
  - Distribution/Geographical
    - 82-002636
  - Paleontology
    - 82-002636
  - Predator/Prey Relationships
    - 82-002535
- Ptychocheilus lucius
  - Culture/Propagation
    - 82-000017
  - Raceway Culture
    - 82-000017
- Pungitius pungitius
  - Activity Patterns
    - 82-000941
  - Age/Growth
    - 82-002596
  - Foods/Feeding
    - 82-000941
  - Life History/General
    - 82-002421
  - Pituitary
    - 82-002128
  - Population Studies
    - 82-002596

## SYSTEMATIC INDEX

...CONTINUED...
Pungitius pungitius
  Reproduction
    82-002421
  Spawning
    82-002421
Puntazzo puntazzo
  Culture/Propagation
    82-002075
  Fry Production
    82-002075
Puntius gonionotus
  Culture/Propagation
    82-000574
  Gamete Storage
    82-000574
Puntius melanampyx singhala
  Taxonomy
    82-001008
Puntius sophore
  Heavy Metals
    82-001123
  Zinc
    82-001123
Puntius ticto
  Cadmium
    82-002855
  Copper
    82-002855
  Heavy Metals
    82-002855
  Mercury
    82-002855
Pylodictis olivaris
  Age/Growth
    82-000292
    82-000958
Quintana atrizona
  Maturation
    82-000084
  Meristic Studies
    82-000084
  Morphology
    82-000084
Rachycentron cadaum
  Commensalism
    82-002416
Raja
  Foods/Feeding
    82-000901
  Taxonomy
    82-002698
Raja clavata
  Abnormalities
    82-001365
  Fins
    82-001365
Raja eglanteria
  Acoustico-Lateralis System
    82-001355

...CONTINUED...
Raja eglanteria
  Nervous System
    82-001368
Raja erinacea
  Excretory System
    82-000729
  Taurine
    82-000729
Raja heemstrai
  New Species
    82-002698
Rajiformes
  Commerical Fishing
    82-002916
  Harvest
    82-002916
Rastrelliger kanagurta
  Age/Growth
    82-002611
  Distribution/Geographical
    82-002634
Reinhardtius hippoglossoides
  Commerical Fishing
    82-002447
  Fish Stocks
    82-002467
  Life History/General
    82-002447
  Morphology
    82-002140
  Parasites/Diseases
    82-002467
  Protozoan Diseases
    82-002467
Rhincodon typus
  Distribution/Geographical
    82-000310
Rhinichthys atratulus
  Predator/Prey Relationships
    82-001679
Rhinichthys osculus
  Competition
    82-002390
  Distribution/Geographical
    82-001720
  Foods/Feeding
    82-002566
  Status
    82-001720
Rhinogobius brunneus
  Habitat Selection
    82-002408
Rhinoptera bonasus
  Commensalism
    82-002416
Rhinoptera javanica
  Distribution/Geographical
    82-002650
Rhizoprionodon
  Distribution/Geographical
    82-000301

## SYSTEMATIC INDEX

...CONTINUED...

- Rhodeus ocellatus ocellatus
  - Movements
    - 82-000872
  - Pheromones
    - 82-000879
  - Population Studies
    - 82-000872
  - Spawning
    - 82-000879
- Rhodeus sericeus
  - Life History/General
    - 82-002444
- Rhodoniichthys
  - Taxonomy
    - 82-000352
- Rhombosolea retiaria
  - Digestive System
    - 82-000732
- Richardsonius balteatus
  - Distribution/Geographical
    - 82-001710
- Rivulus santensis
  - Dentition
    - 82-002198
  - Teeth
    - 82-002198
- Rosenblattichthys hubbsi
  - Early Development
    - 82-002127
- Rostrelliger kanagurta
  - Distribution/Geographical
    - 82-002644
- Rutilus rutilus
  - Age/Growth
    - 82-002596
  - Cadmium
    - 82-002787
  - Cestodes
    - 82-001073
  - Digestion Rates
    - 82-000685
    - 82-001478
  - Digestive System
    - 82-001424
  - Foods/Feeding
    - 82-000270
  - Heavy Metals
    - 82-002787
  - Hybridization
    - 82-000781
  - Lead
    - 82-002787
  - Ligula intestinalis
    - 82-001073
  - Metabolic Rates
    - 82-002298
  - Parasites/Diseases
    - 82-001073

...CONTINUED...

- Rutilus rutilus
  - Parasites/Diseases
    - 82-001808
  - Pharyngeal Teeth
    - 82-002156
  - Population Studies
    - 82-002596
  - Protozoan Diseases
    - 82-001808
  - Respiration
    - 82-002298
  - Rheotropism
    - 82-001577
  - Temperature
    - 82-000700
  - Thermal Pollution
    - 82-000407
  - Trichodina
    - 82-001808
  - Zinc
    - 82-002787
- Rutilus rutilus hecheli
  - Amino Acids
    - 82-000157
  - Eggs
    - 82-000157
  - Lipid Composition
    - 82-000157
- Salilota australis
  - Distribution/Geographical
    - 82-002642
  - Distribution/Seasonal
    - 82-002642
- Salmo apache
  - Life History/General
    - 82-001165
  - Management/Research--General
    - 82-001165
- Salmo clarki
  - Competition
    - 82-000193
  - Early Development
    - 82-002122
  - Hooking Mortality
    - 82-002874
  - Management/Research--General
    - 82-001152
  - Movements
    - 82-002516
  - New Subspecies
    - 82-001152
  - Spawning Migration
    - 82-002516
  - Taxonomy
    - 82-001152
- Salmo clarki clarki
  - Management/Research--Rivers and Streams
    - 82-001245
  - Status
    - 82-001245
- Salmo clarki henshawi
  - Management/Research--Lakes
    - 82-001233

...CONTINUED...

Salmo clarki lewisi
  Electrophoresis
   82-001540
Salmo clarki macdonaldi
  Status
   82-002671
  Taxonomy
   82-002671
Salmo clarki pleuriticus
  Culture/Propagation
   82-002056
Salmo clarki utah
  Culture/Propagation
   82-002056
  Life History/General
   82-000831
  Management/Research--General
   82-000831
Salmo gairdneri
  Abnormalities
   82-001362
  Acanthocephala
   82-000388
  Acanthocephalus lucidus
   82-000388
  Acephate
   82-001147
  Acid Mine Water
   82-001104
  Acids
   82-001126
  Activity Patterns
   82-000802
  Adrenalin
   82-001476
  Aeromonas salmonicida
   82-001795
   82-001797
   82-002733
   82-002735
  Age/Growth
   82-000518
   82-000930
   82-001688
   82-002057
   82-002462
   82-002871
  Amino Acids
   82-000156
   82-002097
   82-002371
  Ammonia
   82-000421
  Anemia
   82-000754
  Anesthetics
   82-000422
   82-000565

...CONTINUED...
Salmo gairdneri
  Anesthetics
   82-001912
   82-002858
  Anoxia
   82-002267
  Aroclor
   82-001145
  Ascorbic Acid
   82-001492
   82-002097
  Bacterial Diseases
   82-001039
   82-001044
   82-001790
   82-001792
   82-001795
   82-001797
   82-001800
   82-002727
   82-002733
   82-002735
  Bacterial Kidney Disease
   82-001790
  Bayer 73
   82-002868
  Benzene
   82-001901
  Biochemical Composition
   82-001452
   82-001499
  Biomagnification
   82-001883
   82-002812
  Blood
   82-002163
  Blood Chemistry
   82-000085
   82-000693
   82-000712
   82-000713
   82-000727
   82-000744
   82-000754
   82-001401
   82-001422
   82-001464
   82-001493
   82-001501
   82-002315
   82-002335
   82-002338
   82-002343
   82-002353
   82-002355
   82-002357
   82-002366
  Botulism
   82-002727
  Cadmium
   82-002866

## SYSTEMATIC INDEX

...CONTINUED...
- Salmo gairdneri
  - Cage Culture
    - 82-002058
  - Cardio-Vascular System
    - 82-000657
    - 82-001397
    - 82-001484
    - 82-001512
    - 82-002248
    - 82-002267
  - Catchability
    - 82-002871
  - Catecholamines
    - 82-002366
  - Cestodes
    - 82-001829
  - Chlorine
    - 82-001464
  - Clostridium botulinum
    - 82-002727
  - Coloration
    - 82-001362
    - 82-002195
  - Competition
    - 82-000193
    - 82-000917
    - 82-002556
  - Condition Factors
    - 82-002462
  - Copper
    - 82-000205
    - 82-000423
    - 82-001126
    - 82-001868
    - 82-001909
  - Cortisol
    - 82-001493
    - 82-002353
  - Culture/Propagation
    - 82-000011
    - 82-000029
    - 82-000465
    - 82-000518
    - 82-000522
    - 82-000544
    - 82-000554
    - 82-000561
    - 82-000563
    - 82-001320
    - 82-001321
    - 82-001323
    - 82-001328
    - 82-001330
    - 82-001338
    - 82-001342
    - 82-002057
    - 82-002058
    - 82-002090
  - Currents
    - 82-000187

...CONTINUED...
- Salmo gairdneri
  - Cyanide
    - 82-001918
    - 82-002842
    - 82-002843
  - Detergents
    - 82-002851
  - Diets
    - 82-000029
    - 82-001321
    - 82-002090
  - Digestive System
    - 82-000048
    - 82-000686
    - 82-001354
  - Digestive System/Bacterial Flo
    - 82-000118
  - Dimethylformamide
    - 82-001137
  - Diplostomum spathaceum
    - 82-001083
  - Distribution/Geographical
    - 82-000962
  - Early Development
    - 82-002122
  - Economic Values
    - 82-001186
  - Egtved Virus
    - 82-001060
    - 82-001839
  - Electrophoresis
    - 82-001528
    - 82-001541
  - Endocrinology
    - 82-000643
    - 82-000669
    - 82-000693
    - 82-000702
    - 82-001413
    - 82-001417
    - 82-002167
    - 82-002214
    - 82-002244
    - 82-002335
    - 82-002358
    - 82-002367
  - Enzymes
    - 82-000131
    - 82-000654
    - 82-002347
    - 82-002371
  - Excretory System
    - 82-000630
  - Exercise
    - 82-001484
    - 82-002324
  - Feeding Experiments
    - 82-000561
    - 82-000563

...CONTINUED...
Salmo gairdneri
  Feeding Experiments
    82-001320
    82-001321
    82-001323
    82-001328
    82-002090
  Feeds
    82-000544
    82-000554
    82-001320
    82-001328
    82-001330
  Fennosan F 50
    82-002862
  Fertilization
    82-000639
  Filtration Systems
    82-001338
  Fins
    82-000607
  Fish Hatchery Effluents
    82-002058
  Fish Kills
    82-002822
  Fish Stocks
    82-000830
  Flow Regimes
    82-001247
  Fluoride
    82-001330
  Fluridone
    82-002806
  Foods/Feeding
    82-000917
    82-000930
    82-000938
    82-002556
  Foods/Feeding/Selectivity
    82-001655
  Furunculosis
    82-001795
    82-002733
  Genetic Strains
    82-001541
    82-001584
    82-002871
    82-002943
  Geothermal Effects
    82-001528
  Gills
    82-000621
  Glucose
    82-002318
  Growth Stimulants
    82-000522
  Harvest
    82-002996
  Heavy Metals
    82-000205

...CONTINUED...
Salmo gairdneri
  Heavy Metals
    82-000412
    82-000423
    82-001126
    82-001868
    82-001889
    82-001909
    82-001915
    82-001921
    82-002812
    82-002837
    82-002839
    82-002863
    82-002866
  Herbicides
    82-002806
  Hexachlorobenzene
    82-000408
  Hormones
    82-000119
    82-000643
    82-000686
    82-000713
    82-001417
    82-001512
    82-002214
    82-002267
    82-002319
    82-002355
  Hydrocarbons
    82-001093
  Hypoxia
    82-000735
    82-000744
  IHP
    82-001059
  Immune Response
    82-000726
    82-001491
    82-002339
    82-002340
    82-002735
  Immunization
    82-001792
    82-001800
  Insecticides
    82-001124
    82-001142
    82-001147
  Invertebrate Forage
    82-000554
  IPN
    82-001113
    82-001822
  Iron
    82-001889
  Lead
    82-002837
  Life History/General
    82-000211

SYSTEMATIC INDEX

...CONTINUED...
Salmo gairdneri
Life History/General
82-000830
Light
82-000599
82-000802
Lipid Content
82-000119
Lipid Metabolism
82-000090
82-000563
Liver
82-000728
Management/Research--General
82-001948
82-002871
Management/Research--Lakes
82-002461
Management/Research--Reservoirs
82-001186
82-001200
82-002996
82-003000
Matacil
82-001142
Maturation
82-002367
Mercury
82-000412
82-002812
Metabolic Rates
82-000709
82-001518
Mitogens
82-000726
Movements
82-001195
82-001197
MS-222
82-000565
82-002858
Muscular Dystrophy
82-000561
Myxosoma cerebralis
82-001820
Naphthalene
82-001901
Nephrocalcinosus
82-001072
Nickel
82-001868
Nitrite
82-002844
82-002849
Nitrogen Mustard
82-000424
Nutrition
82-000029
82-000030

...CONTINUED...
Salmo gairdneri
Nutrition
82-000552
82-000561
82-000563
82-002086
82-002097
82-002343
Nutritional Diseases
82-001072
Organophosphates
82-001147
Osmoregulation
82-000094
Parasites/Diseases
82-000388
82-000561
82-000754
82-001039
82-001044
82-001059
82-001060
82-001072
82-001083
82-001086
82-001113
82-001790
82-001792
82-001795
82-001797
82-001800
82-001813
82-001820
82-001822
82-001829
82-001839
82-002727
82-002733
82-002735
82-002745
Pentachlorophenate
82-001130
Permethrin
82-001124
pH
82-001104
82-001894
82-002315
Pigmenters
82-000011
Pigments
82-002195
Pineal Body
82-001507
Piscicides
82-002868
Pituitary
82-002167
Pollution Avoidance
82-001866
82-001868

## SYSTEMATIC INDEX

...CONTINUED...
Salmo gairdneri
Polychlorinated Biphenyls
82-001145
82-002827
Polyculture
82-000518
Population Studies
82-002461
82-002462
Production
82-002459
82-002461
82-002462
Proliferative Kidney Disease
82-001086
82-001813
Proteocephalus percae
82-001829
Protozoan Diseases
82-001813
82-001820
Pulp Mill Effluents
82-001132
Put-and-Take
82-001195
82-001197
82-002938
Radionuclides
82-001883
Recirculating Systems
82-001338
82-001342
Reproduction
82-000643
82-000669
82-000730
82-002367
Resin Acids
82-001928
Respiration
82-001501
82-001518
Reticulum Cell
82-002265
Rhabdoviurus salmonis
82-002745
Rheotropism
82-000186
82-000187
Saccus Vasculosus
82-001433
Salinity
82-000639
82-002324
Sekoke Disease
82-000561
Selenium
82-000683
Smooth Endoplasmic Reticulum Cell
82-002265

...CONTINUED...
Salmo gairdneri
Spawning
82-000830
Starvation
82-000131
82-000654
82-000682
Sterilization
82-000515
Steroids
82-000730
Stocking/Introductions
82-001195
82-001197
82-001200
82-002938
82-002943
82-002996
Stress
82-000565
82-002320
82-002353
Surfactants
82-001133
Swimming Performance
82-000709
82-000826
Taste Reception
82-000601
Temperature
82-001401
82-001499
82-001512
82-001584
Temperature Selection
82-001584
Terbutryn
82-002806
Tetrachloroethylene
82-001137
Thiourea
82-000095
Thorium
82-001883
Thymus
82-002201
Transportation
82-000565
Trematodes
82-001083
Triploid Fish
82-002388
Two-Story Fisheries
82-003000
Tylodelphys clavata
82-001083
Uranium
82-001883
Vanadium
82-001909

...CONTINUED...
Salmo gairdneri
Vanadium
82-002857
Vibrio anguillarum
82-001792
82-001795
82-001797
Vibriosis
82-001044
82-001792
82-001795
Viral Diseases
82-001059
82-001060
82-001113
82-001822
82-001839
82-002745
Visceral Granuloma
82-001072
Vision
82-000599
82-000802
82-002154
Vitamins
82-000030
82-002277
Vitellogenin
82-000643
Whirling Disease
82-001820
Yersinia ruckeri
82-001800
Yield
82-002462
Zinc
82-001915
82-001921
82-002839
82-002863
2-Phenoxyethanol
82-000422
Salmo gilae
Age/Growth
82-002906
Life History/General
82-001165
Management/Research--General
82-001165
Movements
82-002906
Stream Improvement/General
82-002906
Salmo salar
Fish Stocks
82-000843
Age/Growth
82-000160
82-000518

...CONTINUED...
Salmo salar
Age/Growth
82-000953
82-002440
82-002474
Bacterial Diseases
82-001040
Biomass
82-002474
Buoyancy Adjustment
82-001582
Cadmium
82-002853
Commercial Fishing
82-003021
Cryolite Recovery Sludge
82-002800
Culture/Propagation
82-000031
82-000518
82-001535
Diets
82-000031
Egg Size
82-000773
Endocrincology
82-000689
Endocrinology
82-002367
Feeding Experiments
82-000031
Fish Stocks
82-000783
82-001253
Flow Regimes
82-000843
Gradient
82-001569
Gyrodactylus
82-002769
Habitat Selection
82-000197
82-001569
82-002395
Harvest
82-003021
Healing
82-000681
Heavy Metals
82-002853
Hormones
82-000689
Hybridization
82-000773
82-001535
Immune Response
82-001040
Immunization
82-001040
Industrial Wastes
82-002800

## SYSTEMATIC INDEX

...CONTINUED...

- Salmo salar
  - Life History/General
    - 82-002440
  - Management/Research--General
    - 82-000783
    - 82-001949
  - Management/Research--Marine
    - 82-003021
  - Management/Research--Rivers and Streams
    - 82-001253
  - Maturation
    - 82-000160
    - 82-002367
    - 82-002499
  - Movements
    - 82-000262
    - 82-000891
  - Orientation/Homing
    - 82-000889
    - 82-001552
  - Osmoregulation
    - 82-002237
  - Parasites/Diseases
    - 82-001040
    - 82-001058
    - 82-001780
    - 82-001810
    - 82-002769
  - Parr-Smolt Transformation
    - 82-000110
  - Pheromones
    - 82-001559
  - Polyculture
    - 82-000518
  - Population Studies
    - 82-000229
    - 82-002474
    - 82-002968
  - Production
    - 82-000229
    - 82-002474
  - Proliferative Kidney Disease
    - 82-001810
  - Protozoan Diseases
    - 82-001810
  - Reproduction
    - 82-002367
  - Riboflavin
    - 82-001559
  - Spawning
    - 82-002478
  - Spawning Migration
    - 82-000843
    - 82-000875
    - 82-000889
    - 82-001634
  - Stocking/Introductions
    - 82-001253
    - 82-002937

...CONTINUED...

- Salmo salar
  - Temperature
    - 82-000843
    - 82-002285
  - Trematodes
    - 82-002769
  - Ulcerative Dermal Necrosis
    - 82-001780
  - Viral Diseases
    - 82-001058
  - Viral Hemorrhagic Septicemia
    - 82-001058
- Salmo trutta
  - Aeromonas salmonicida
    - 82-001789
  - Age/Growth
    - 82-000518
    - 82-000737
    - 82-000953
    - 82-001616
    - 82-001674
  - ATP
    - 82-002326
  - Bacterial Diseases
    - 82-001039
    - 82-001789
  - Blood Chemistry
    - 82-002326
    - 82-002848
  - Buoyancy Adjustment
    - 82-001582
  - Calcium
    - 82-001896
  - Chloromyxum truttae
    - 82-001806
  - Competition
    - 82-000182
    - 82-001651
    - 82-002556
  - Culture/Propagation
    - 82-000518
  - Diplostomum spathaceum
    - 82-001083
  - Early Development
    - 82-002122
  - Egg Planting
    - 82-002939
  - Egg Size
    - 82-000773
  - Electrophoresis
    - 82-001543
  - Endocrinology
    - 82-002293
  - Enzymes
    - 82-000152
  - Fennosan F 50
    - 82-002862
  - Fish Kills
    - 82-002822

...CONTINUED...
Salmo trutta
  Flow Regimes
    82-001247
  Foods/Feeding
    82-000737
    82-000938
    82-001651
    82-001652
    82-002556
  Genetics
    82-002382
  Gradient
    82-001569
  Habitat Selection
    82-001569
    82-002395
  Heavy Metals
    82-000410
  Hybridization
    82-000773
  Lipid Metabolism
    82-000737
  Liver
    82-000152
  Management/Research--Reservoirs
    82-001200
  Mortality Rates
    82-001616
  Movements
    82-001195
    82-002382
  Mucus
    82-002226
  Osmoregulation
    82-000705
  Parasites/Diseases
    82-001039
    82-001083
    82-001780
    82-001789
    82-001806
    82-001810
  pH
    82-000705
    82-001896
    82-002326
    82-002848
  Polychlorinated Biphenyls
    82-001873
  Polyculture
    82-000518
  Population Genetics
    82-002375
  Population Studies
    82-001616
    82-002469
  Predator/Prey Relationships
    82-001652
  Production
    82-002459
...CONTINUED...
Salmo trutta
  Production
    82-002469
  Proliferative Kidney Diseas
    82-001810
  Protozoan Diseases
    82-001806
    82-001810
  Put-and-Take
    82-001195
  Spawning
    82-000256
  Stocking/Introductions
    82-001195
    82-001200
    82-002939
  Stress
    82-000722
  Swimming Performance
    82-000158
  Temperature
    82-000737
  Trematodes
    82-001083
  Tylodelphys clavata
    82-001083
  Ulcerative Dermal Necrosis
    82-001780
  Variation Studies
    82-002375
  Zinc
    82-000410
Salmo trutta lacustris
  Culture/Propagation
    82-001283
  Endocrinology
    82-001502
  Hormones
    82-001502
Salmonidae
  Abundance/Factors of
    82-000994
  Age/Growth
    82-000994
    82-002379
    82-002584
  Allochthonous Food
    82-002557
  Bacterial Diseases
    82-001793
    82-001794
  Blood Chemistry
    82-002337
  Catch and Release
    82-002925
  Clearcutting
    82-001960
  Competition
    82-002535
  Creel Census
    82-002914

# SYSTEMATIC INDEX

...CONTINUED...
- Salmonidae
  - Culture/Propagation
    - 82-000520
    - 82-002093
  - Endangered/Threatened Species
    - 82-001169
  - Enzymes
    - 82-000706
  - Excretory System
    - 82-002327
  - Feeders
    - 82-002093
  - Fish Counters
    - 82-001219
  - Fish Stocks
    - 82-000776
    - 82-001169
    - 82-002480
  - Foods/Feeding
    - 82-002557
  - Forestry Practices
    - 82-001960
  - General
    - 82-000520
  - Grazing
    - 82-001177
  - Hybridization
    - 82-002373
  - IHN
    - 82-001818
  - Immune Response
    - 82-000115
  - Immunization
    - 82-001793
    - 82-001794
    - 82-001837
  - IPN
    - 82-001818
  - Management/Research--General
    - 82-000776
    - 82-001161
  - Management/Research--Rivers and Streams
    - 82-001244
    - 82-001953
    - 82-002893
    - 82-002925
  - Mortality Rates
    - 82-000994
  - Parasites/Diseases
    - 82-001793
    - 82-001794
    - 82-001818
    - 82-001837
  - Parr-Smolt Transformation
    - 82-001385
  - Population Genetics
    - 82-000776
  - Predator/Prey Relationships
    - 82-000282

...CONTINUED...
- Salmonidae
  - Predator/Prey Relationships
    - 82-002535
  - Regulations
    - 82-002925
  - Restoration of Anadromous Runs
    - 82-001244
  - Riparian Habitat
    - 82-001177
    - 82-002557
  - Road Construction
    - 82-001953
  - Spawning Migration
    - 82-002480
  - Stream Improvement/General
    - 82-001953
    - 82-002893
  - Stream Relocation
    - 82-001953
  - Thermal Pollution
    - 82-002914
  - Vibrio anguillarum
    - 82-001793
    - 82-001794
  - Viral Diseases
    - 82-001818
    - 82-001837
  - Viral Hemorrhagic Septicemia
    - 82-001837
  - Yersinia ruckeri
    - 82-001793
    - 82-001794
- Salmonoidei
  - Taxonomy
    - 82-000341
- Salvelinus
  - Skeletal System
    - 82-001382
  - Taxonomy
    - 82-001015
- Salvelinus alpinus
  - Abundance/Factors of
    - 82-001748
  - Age/Growth
    - 82-001700
  - Distribution/Factors of
    - 82-002620
  - Dwarfism
    - 82-002424
    - 82-002496
  - Foods/Feeding
    - 82-000928
    - 82-002424
  - Habitat Selection
    - 82-002424
  - Mortality Factors
    - 82-001748
  - Nets/Netting
    - 82-001985
  - Osmoregulation
    - 82-001748

...CONTINUED...

- Salvelinus alpinus
  - Spawning
    - 82-002496
  - Taxonomy
    - 82-002711
  - Temperature
    - 82-001700
- Salvelinus fontinalis
  - Abundance/Factors of
    - 82-000874
  - Aeromonas salmonicida
    - 82-001041
    - 82-001042
    - 82-002728
  - Age/Growth
    - 82-000167
    - 82-002440
  - Aluminum
    - 82-001892
    - 82-002859
  - Aroclor
    - 82-001888
  - Artificial Spawning Beds
    - 82-000483
  - Bacterial Diseases
    - 82-001041
    - 82-001042
    - 82-002728
  - Biological Tags
    - 82-000460
  - Chlorinated Compounds
    - 82-000428
  - Chlorinated Hydrocarbons
    - 82-000428
  - Competition
    - 82-000182
    - 82-001651
    - 82-002427
  - Culture/Propagation
    - 82-000012
  - Diplostomum spathaceum
    - 82-002757
  - Early Development
    - 82-002122
  - Electrophoresis
    - 82-000359
    - 82-000769
  - Endocrinology
    - 82-000745
    - 82-002270
  - Endrin
    - 82-001924
  - Enzymes
    - 82-001383
  - Fish Control/Removal
    - 82-002005
  - Foods/Feeding
    - 82-001651
  - Furunculosis
    - 82-001041

...CONTINUED...

- Salvelinus fontinalis
  - Genetic Strains
    - 82-001194
    - 82-001203
  - Hatching Success
    - 82-000989
  - Heavy Metals
    - 82-001892
    - 82-002859
  - Immune Response
    - 82-002728
  - Immunization
    - 82-001042
  - Insecticides
    - 82-000428
    - 82-001924
  - IPN
    - 82-001113
  - Life History/General
    - 82-002427
    - 82-002440
  - Management/Research--Lakes
    - 82-002005
  - Mirex
    - 82-000428
  - Mortality Factors
    - 82-000989
  - Movements
    - 82-001195
  - Myxosoma cerebralis
    - 82-001820
  - Nephrocalcinosis
    - 82-001072
  - Nutritional Diseases
    - 82-001072
  - Ocean Ranching
    - 82-000012
  - Parasites/Diseases
    - 82-000460
    - 82-001041
    - 82-001042
    - 82-001072
    - 82-001113
    - 82-001820
    - 82-002728
    - 82-002757
  - Polychlorinated Biphenyls
    - 82-001888
  - Predator/Prey Relationships
    - 82-002531
  - Production
    - 82-000874
  - Protozoan Diseases
    - 82-001820
  - Put-and-Take
    - 82-001195
  - Reproduction
    - 82-002270
  - Scales
    - 82-002235

...CONTINUED...
- Salvelinus fontinalis
  - Spawning
    - 82-002492
  - Steroids
    - 82-000745
  - Stocking/Introductions
    - 82-001194
    - 82-001195
    - 82-001203
  - Survival
    - 82-001194
    - 82-001203
  - Taxonomy
    - 82-000359
  - Temperature
    - 82-001503
  - Trematodes
    - 82-002757
  - Turbidity
    - 82-001562
  - Variation Studies
    - 82-000359
    - 82-000769
    - 82-001537
  - Viral Diseases
    - 82-001113
  - Visceral Granuloma
    - 82-001072
  - Whirling Disease
    - 82-001820
  - Year Class Strength
    - 82-000874
- Salvelinus fontinalis X S. namaycush
  - pH
    - 82-001916
  - Xenobiotics
    - 82-001916
- Salvelinus leucomaenis
  - Spawning
    - 82-000251
- Salvelinus malma
  - Foods/Feeding
    - 82-000928
- Salvelinus namaycush
  - Amino Acids
    - 82-002087
  - Artificial Spawning Beds
    - 82-000483
    - 82-002010
  - Egg Collection
    - 82-000475
  - Fish Stocks
    - 82-001230
    - 82-001232
  - Heavy Metals
    - 82-001881
    - 82-002837
  - Lead
    - 82-002837

...CONTINUED...
- Salvelinus namaycush
  - Management/Research--Lakes
    - 82-001230
    - 82-001232
    - 82-002010
  - Marking/Tagging
    - 82-002935
  - Mercury
    - 82-001881
  - Movements
    - 82-001199
  - Nets/Netting
    - 82-000475
  - Nutrition
    - 82-002087
    - 82-002096
  - Polychlorinated Biphenyls
    - 82-001873
    - 82-002790
  - Spawning
    - 82-001199
    - 82-002490
    - 82-002511
  - Stocking/Introductions
    - 82-001199
  - Supplemental Stocking
    - 82-001199
  - Survival
    - 82-001199
  - Vitamins
    - 82-002096
  - Wire Tags
    - 82-002935
- Saprus auratus
  - Culture/Propagation
    - 82-001319
- Sardina pilchardus
  - Meristic Studies
    - 82-000057
  - Spawning
    - 82-000259
- Sardinella gibbosa
  - Foods/Feeding
    - 82-002553
- Sardinella longiceps
  - Abundance/Factors of
    - 82-002457
  - Age/Growth
    - 82-002583
    - 82-002599
  - Meristic Studies
    - 82-002123
  - Mortality Rates
    - 82-002457
  - Population Studies
    - 82-002457
  - Variation Studies
    - 82-002123
  - Year Class Strength
    - 82-002457

...CONTINUED...

Sardinella melanura
  Taxonomy
    82-002693
Sardinella nigricaudata
  Taxonomy
    82-002693
Sardinops melanosticta
  Nerocila phaeopleura
    82-001855
  Parasites/Diseases
    82-001855
  Parasitic Copepods
    82-001855
Sardinops sagax
  Distribution/Vertical
    82-002527
Sarotherodon
  Culture/Propagation
    82-002098
  Distribution/Geographical
    82-001705
  Feeding Experiments
    82-002098
  Feeds
    82-002098
  Haplorchis pumilio
    82-001835
    82-001836
  Parasites/Diseases
    82-001835
    82-001836
  Trematodes
    82-001835
    82-001836
Sarotherodon galilaeum
  Foods/Feeding
    82-000908
  Predator/Prey Relationships
    82-000908
Sarotherodon galilaeus
  Foods/Feeding
    82-000910
Saurida
  Fish Lists/Keys
    82-002712
  Taxonomy
    82-001775
    82-002712
Saurida tumbil
  Pancreas
    82-002193
Scarus taeniopterus
  Activity Patterns
    82-001555
Schistura
  Taxonomy
    82-000349
Schizopygopsis microcephalus namensis
  New Subspecies
    82-001719
Schizothorax esocinus
  Fecundity
    82-002505
  Spawning
    82-002505
Sciaenidae
  Distribution/Geographical
    82-000982
Sciaenops ocellata
  Abundance/Factors of
    82-000330
  Early Development
    82-000054
  Embryology
    82-000054
  Heavy Metals
    82-000420
  Lernaeenicus radiatus
    82-002770
  Parasites/Diseases
    82-002770
  Parasitic Copepods
    82-002770
  Salinity
    82-000330
  Temperature
    82-000330
Scleropages leichardti
  Culture/Propagation
    82-002066
  Pond Culture
    82-002066
Scomber japonicus
  Age/Growth
    82-000294
Scomber scombrus
  Anesthetics
    82-002100
  Blood Chemistry
    82-002354
  Culture/Propagation
    82-002100
  Distribution/Seasonal
    82-000895
  Foods/Feeding
    82-000895
  Halvorsenius exilis
    82-000385
  Kuhnia scombri
    82-001069
  Parasites/Diseases
    82-000385
    82-001069
  Quinaldine
    82-002100
  Respiration
    82-001425
  Transportation
    82-002100

...CONTINUED...

- Scomber scombrus
  - Trematodes
    - 82-000385
    - 82-001069
- Scomberomorus cavalla
  - Blood Chemistry
    - 82-000123
  - Foods/Feeding
    - 82-000278
  - Identification/Larvae
    - 82-000355
  - Reproduction
    - 82-000123
- Scomberomorus maculatus
  - Blood Chemistry
    - 82-000148
  - Electrophoresis
    - 82-000148
  - Foods/Feeding
    - 82-000278
  - Identification/Larvae
    - 82-000355
- Scombresox saurus
  - Foods/Feeding
    - 82-002561
  - Trophic Relationships
    - 82-002561
- Scombridae
  - Commercial Fishing
    - 82-002453
  - Culture/Propagation
    - 82-000185
    - 82-002088
  - Digestive System
    - 82-000703
  - Enzymes
    - 82-000703
  - Feeding Experiments
    - 82-002088
  - Foods/Feeding
    - 82-000283
  - Harvest
    - 82-002453
  - Life History/General
    - 82-002453
  - Management/Reseach--Marine
    - 82-002034
  - Orientation/Homing
    - 82-000185
  - Swimming Performance
    - 82-002409
  - Taxonomy
    - 82-002669
- Scopelarchidae
  - Distribution/Geographical
    - 82-002689
  - Taxonomy
    - 82-002689
- Scopelarchoides danae
  - Early Development
    - 82-002127
- Scopelarchus michaelsarsi
  - Early Development
    - 82-002127
- Scophthalmus maeoticus
  - Culture/Propagation
    - 82-000005
  - Endocrinology
    - 82-000005
  - Induced Maturation
    - 82-000005
- Scophthalmus maximus
  - Bacterial Diseases
    - 82-000364
    - 82-002726
  - Culture/Propagation
    - 82-000541
  - Parasites/Diseases
    - 82-000364
    - 82-002726
  - Recirculating Systems
    - 82-000541
  - Vibriosis
    - 82-000364
    - 82-002726
- Scorpaenidae
  - Age/Growth
    - 82-000854
  - Mortality Rates
    - 82-000854
- Scyliorhinus
  - Locomotion
    - 82-001517
  - Nervous System
    - 82-001517
- Scyliorhinus canicula
  - Cardio-Vascular System
    - 82-002313
  - Endocrinology
    - 82-002284
  - Heavy Metals
    - 82-001939
  - Osmoregulation
    - 82-000634
  - Zinc
    - 82-001939
- Scymnorhinus licha
  - Foods/Feeding
    - 82-000927
- Searsiidae
  - Taxonomy
    - 82-000356
- Sebastes
  - Musculature
    - 82-000064
  - Sound Production
    - 82-000064
- Sebastes auriculatus
  - Abnormalities
    - 82-000589

...CONTINUED...
Sebastes auriculatus
  Pugheadedness
    82-000589
Sebastes dallii
  Early Development
    82-000068
Sebastes diploproa
  Age/Growth
    82-000946
  Light
    82-000946
  Temperature
    82-000946
Sebastes paucispinis
  Parasites/Diseases
    82-002720
Sebastes serranoides
  Life History/General
    82-000214
Sebastinae
  Taxonomy
    82-002670
Sebastolobus
  Enzymes
    82-001500
Semotilus atromaculatus
  Competition
    82-002427
  Predator/Prey Relationships
    82-001679
  Turbidity
    82-001562
Semotilus margarita
  Foods/Feeding
    82-001670
Seriola dorsalis
  Distribution/Geographical
    82-000318
Seriola dumerili
  Bucephalus gorgon
    82-001846
  Parasites/Diseases
    82-001846
  Trematodes
    82-001846
Seriola lalandei
  Foods/Feeding
    82-002565
  Parasites/Diseases
    82-002741
  Predator/Prey Relationships
    82-002565
  Protozoan Diseases
    82-002741
  Unicapsula seriolae
    82-002741
Seriola quinqueradiata
  Bacterial Diseases
    82-002731

...CONTINUED...
Seriola quinqueradiata
  Blood
    82-000611
  Cardio-Vascular System
    82-000611
  Culture/Propagation
    82-002080
    82-002081
  Cytophaga
    82-002731
  Diets
    82-002080
    82-002081
  Enzymes
    82-001414
  Feeding Experiments
    82-002080
  Foods/Feeding/Selectivity
    82-002543
  Hormones
    82-001414
  Nutrition
    82-002081
  Parasites/Diseases
    82-002731
Seriolella punctata
  Early Development
    82-000052
  Embryology
    82-000052
Seriphus politus
  Fecundity
    82-000244
Serranidae
  Distribution/Geographical
    82-001714
    82-002619
  Fish Lists/Keys
    82-000978
  Population Studies
    82-001620
Serrasalminae
  Taxonomy
    82-002696
Siganus canalicullatus
  Culture/Propagation
    82-001304
Sillago bassensis
  Titanium Plant Effluents
    82-001867
Sillago sihama
  Age/Growth
    82-002591
  Condition Factors
    82-002591
  Culture/Propagation
    82-002063
  Harvest
    82-002591

...CONTINUED...
Sillago sihama
  Management/Research--Lakes
    82-002591
Silurus glanis
  Chemoreception
    82-002406
  Karyotypes
    82-000158
Solea solea
  Black Patch Necrosis
    82-001080
  Chemoreception
    82-002405
  Culture/Propagation
    82-000539
    82-000545
  Culture/Propagaton
    82-000547
  Feeding Experiments
    82-000545
    82-000547
  Fingerling Production
    82-000539
    82-000545
    82-000547
  Foods/Feeding
    82-002405
  Parasites/Diseases
    82-001080
  Taste Reception
    82-002405
Solea vulgaris
  Management/Research--Lakes
    82-002978
Somniosus pacificus
  Morphology
    82-002200
Sparus auratus
  Culture/Propagation
    82-001329
  Feeding Experiments
    82-001319
    82-001329
  Feeds
    82-001319
    82-001329
  Foods/Feeding
    82-001570
  Lymphocystis
    82-002746
  Parasites/Diseases
    82-002746
  Swimming Performance
    82-001570
  Viral Diseases
    82-002746
Sphoeroides pachygaster
  Distribution/Geographical
    82-000307
Sphyrna
  Distribution/Geographical
    82-000301
Sphyrna blockii
  Embryology
    82-002125
Spicara smaris
  Metabolic Rates
    82-000113
Spirinchus lanceolatus
  Fins
    82-002182
  Maturation
    82-002182
  Sexual Dimorphism
    82-002182
  Spawning
    82-002182
Spottobrotula amaculata
  New Species
    82-002676
Sprattus sprattus
  Acoustico-Lateralis System
    82-000593
  Meristic Studies
    82-002147
  Population Studies
    82-000856
    82-000870
    82-000871
    82-002475
  Predator/Prey Relationships
    82-002533
  Recruitment
    82-000871
  Variation Studies
    82-002147
Squalus acanthias
  Blood Chemistry
    82-002222
  Cardio-Vascular System
    82-002291
  Enzymes
    82-001432
  Excretory System
    82-000729
  Glucose
    82-000660
  Osmoregulation
    82-001407
    82-002291
  Parasites/Diseases
    82-001088
  pH Regulation
    82-001407
  Rectal Gland
    82-002291
  Skin Lesions
    82-001088

## SYSTEMATIC INDEX

...CONTINUED...
- Squalus acanthias
  - Swimming Performance
    - 82-001563
  - Taurine
    - 82-000729
- Squalus japonicus
  - Reproduction
    - 82-000261
- Stegastes fasciolatus
  - Social Behavior
    - 82-001630
  - Spawning
    - 82-001630
- Stemonosudis rothschildi
  - Distribution/Geographical
    - 82-001726
- Stenodus leucichthys
  - Blood Chemistry
    - 82-002299
  - Electrophoresis
    - 82-002299
  - Reproduction
    - 82-002299
- Sternopygus
  - Electrolocation
    - 82-000188
- Stizostedion canadense
  - Age/Growth
    - 82-001594
  - Bioenergetics
    - 82-002316
  - Foods/Feeding
    - 82-001594
  - Management/Research--Reservoirs
    - 82-001594
  - Population Studies
    - 82-001594
- Stizostedion vitreum
  - Foods/Feeding/Selectivity
    - 82-000922
  - Predator/Prey Relationships
    - 82-000922
- Stizostedion vitreum vitreum
  - Harvest
    - 82-002983
  - Abundance/Factors of
    - 82-001766
  - Age/Growth
    - 82-000285
    - 82-000952
    - 82-001766
  - Commercial Fishing
    - 82-002983
  - Culture/Propagation
    - 82-000019
    - 82-000020
  - Electofishing
    - 82-002959
  - Electrophoresis
    - 82-000768

...CONTINUED...
- Stizostedion vitreum vitreum
  - Electrophoresis
    - 82-002017
  - Fecundity
    - 82-000768
  - Fingerling Culture
    - 82-000019
    - 82-000020
  - Fish Stocks
    - 82-000768
  - Foods/Feeding
    - 82-000020
  - Genetic Strains
    - 82-002017
  - Management/Research--General
    - 82-000768
  - Management/Research--Lakes
    - 82-002942
    - 82-002983
  - Mangement/Research--Reservoirs
    - 82-002017
  - Maturation
    - 82-000768
  - Olfaction
    - 82-000047
  - Pond Culture
    - 82-000019
    - 82-000020
  - Population Studies
    - 82-002983
  - Stocking/Introductions
    - 82-002942
  - Variation Studies
    - 82-000768
- Stolephorus bataviensis
  - Commericial Fishing
    - 82-003017
  - Harvest
    - 82-003017
- Stolephorus devisi
  - Commercial Fishing
    - 82-003017
  - Harvest
    - 82-003017
- Sudis
  - Early Development
    - 82-002127
- Synbranchus marmoratus
  - Air Breathing
    - 82-002276
- Syngnathus uncinatus
  - Taxonomy
    - 82-001007
- Tachysurus tenuispinis
  - Fecundity
    - 82-002688
  - Foods/Feeding/Selectivity
    - 82-002559
  - Harvest
    - 82-002917
  - Length-Weight Relationships
    - 82-002581

## SYSTEMATIC INDEX

...CONTINUED...
Tachysurus tenuispinis
  Maturation
    82-002488
  Spawning
    82-002488
Tachysurus thalassinus
  Age/Growth
    82-002594
  Commercial Fishing
    82-002920
  Harvest
    82-002917
    82-002920
  Maturation
    82-002500
  Spawning
    82-002500
Tandanus tandanus
  Spawning
    82-000885
Taractes asper
  Distribution/Geographical
    82-000322
Tautogolabrus adspersus
  Blood Chemistry
    82-000680
Tetrabrachium
  Skeletal System
    82-000351
  Taxonomy
    82-000351
Tetragonurus
  Foods/Feeding
    82-000271
  Predator/Prey Relationships
    82-000271
Tetraodontidae
  Distribution/Geographical
    82-000307
  Taxonomy
    82-001768
Tetraodontiformes
  Dentition
    82-000590
  Karyotypes
    82-002376
Thalassoma duperrey
  Hermaphroditism
    82-002336
  Sex Reversal
    82-002336
Thalassoma lucasanum
  Reproduction
    82-002512
  Spawning
    82-002512
Theragra chalcogramma
  Economic Values
    82-001970

...CONTINUED...
Theragra chalcogramma
  Egg Drift
    82-000255
  Management/Research--Marine
    82-000234
  Maturation
    82-000755
  Meristic Studies
    82-000079
  Parasites/Diseases
    82-001777
  Population Studies
    82-000234
  Sexual Dimorphism
    82-000079
Thunnus alalunga
  Scales
    82-000617
Thunnus albacares
  Age/Growth
    82-000300
  Fishing Gear
    82-001213
  Foods/Feeding
    82-000273
  Longlines
    82-001213
Thunnus obesus
  Foods/Feeding
    82-000273
Thunnus thynnus
  Culture/Propagation
    82-001336
  Fecundity
    82-002477
  Gamete Storage
    82-001336
  Reproduction
    82-002477
  Spawning
    82-002477
Thymallus arcticus
  Foods/Feeding
    82-001666
Thymallus arcticus baicalensis
  Cardio-Vascular System
    82-002288
  Oxygen
    82-002288
  Respiration
    82-002288
  Temperature
    82-002288
Thymallus grubei
  Ecology
    82-002448
  Life History/General
    82-002448
Thymallus thymallus
  Age/Growth
    82-000295

...CONTINUED...
Thymallus thymallus
  Identification
    82-001191
  Individual Marking
    82-001191
  Marking/Tagging
    82-001191
Tiaroga cobitis
  Foods/Feeding
    82-002566
Tilapia
  Cage Culture
    82-001295
  Culture/Propagation
    82-001291
    82-001295
  Distribution/Geographical
    82-001705
  Haplorchis pumilio
    82-001835
    82-001836
  Hybridization
    82-001529
  Movements
    82-000899
  Parasites/Diseases
    82-001835
    82-001836
  Polyculture
    82-001291
  Sex Determination
    82-000569
  Trematodes
    82-001835
    82-001836
Tilapia aurea
  Cage Culture
    82-000524
  Culture/Propagation
    82-000524
    82-000527
    82-000572
    82-001215
  Digestive System
    82-001482
  Fertilization/Soil and Water
    82-001215
  Pond Culture
    82-000527
    82-001215
  Rearing Capacity
    82-000527
  Selective Breeding
    82-000524
  Sex Reversal
    82-000572
  Tank Culture
    82-000527
  Temperature
    82-000731
Tilapia mariae
  Distribution/Geographical
    82-000302
  Temperature
    82-000731
Tilapia melanotheron
  Temperature
    82-000731
Tilapia mossambica
  Brooding Behavior
    82-001587
  Caudal Neurosecretory System
    82-001457
  Culture/Propagation
    82-000527
    82-000551
    82-002068
    82-002089
  Culture/Propagaton
    82-000550
  Diets
    82-000550
    82-002089
  Digestive System/Bacterial Flora
    82-002349
  Distribution/Geographical
    82-001706
  Endocrinology
    82-000668
    82-001412
    82-001457
    82-001458
    82-002311
    82-002364
  Feeding Experiments
    82-000550
    82-002089
  Fish Preservation
    82-003026
  Habitat Selection
    82-002392
  Heavy Metals
    82-001936
  Hermaphroditism
    82-000725
  Hormones
    82-000710
    82-001412
    82-002311
    82-002364
  Naphthalene
    82-002829
  Nutrition
    82-000551
    82-002089
  Osmoregulation
    82-000668
    82-001412
    82-001457

...CONTINUED...
- Tilapia mossambica
  - Osmoregulation
    - 82-001458
    - 82-002273
  - pH
    - 82-000431
  - Pond Culture
    - 82-000527
    - 82-002068
  - Rearing Capacity
    - 82-000527
  - Sex Determination
    - 82-000710
  - Skeletal System
    - 82-002364
  - Swimbladder
    - 82-002241
  - Tank Culture
    - 82-000527
  - Temperature
    - 82-000731
  - Trophic Relationships
    - 82-002392
- Tilapia nilotica
  - Age/Growth
    - 82-000299
  - Blood Chemistry
    - 82-000741
  - Culture/Propagation
    - 82-001322
  - Digestive System/Bacterial Flora
    - 82-002350
  - Early Development
    - 82-001370
  - Embryology
    - 82-001370
  - Enzymes
    - 82-000741
  - Exploitation Rates
    - 82-002008
  - Feeding Experiments
    - 82-001322
  - Light
    - 82-000299
  - Mortality Rates
    - 82-002008
  - Otoliths
    - 82-000629
  - Vitamins
    - 82-001322
- Tilapia variabilis
  - Exploitation Rates
    - 82-002008
  - Mortality Rates
    - 82-002008
- Tilapia zillii
  - Electrophoresis
    - 82-002377
  - Enzymes
    - 82-002377

...CONTINUED...
- Tilapia zillii
  - Management/Research--Lakes
    - 82-002978
- Tilapiini
  - Taxonomy
    - 82-001028
- Tinca tinca
  - Asymphylodora tincae
    - 82-001089
  - Blood Chemistry
    - 82-000085
  - Chemoreception
    - 82-002406
  - Parasites/Diseases
    - 82-001089
  - Trematodes
    - 82-001089
- Tor
  - Karyotypes
    - 82-000774
- Tor putitora
  - Spawning
    - 82-002508
- Torpedo marmorata
  - Auditory Senses
    - 82-000602
  - Electric Organs
    - 82-000149
    - 82-000663
    - 82-000721
  - Electrophysiology
    - 82-001436
  - Otoliths
    - 82-000602
- Torpedo nobiliana
  - Auditory Senses
    - 82-000602
  - Otoloths
    - 82-000602
- Torpedo ocellata
  - Electric Organs
    - 82-000721
- Trachichthodes druzhinini
  - New Species
    - 82-001001
- Trachurus
  - Electrophoresis
    - 82-002275
  - Taxonomy
    - 82-000357
- Trachurus declivis
  - Biochemical Composition
    - 82-002360
  - Ceratothoa imbricatus
    - 82-001078
  - Lipid Content
    - 82-002360
  - Parasites/Diseases
    - 82-001078

...CONTINUED...
Trachurus declivis
Parasitic Isopods
82-001078
Trachurus mediterraneus
Skeletal System
82-002164
Trachurus mediterraneus ponticus
Blood Chemistry
82-002224
Exercise
82-002224
Trachurus novaezelandiae
Biochemical Composition
82-002360
Lipid Content
82-002360
Trachurus picturatus australis
Fecundity
82-002483
Spawning
82-002483
Trachurus symmetricus
Age/Growth
82-000294
Trachurus symmetricus murphyi
Foods/Feeding
82-000272
Trachurus trachurus
Skeletal System
82-002164
Trematomus
Antifreeze Production
82-000717
Osmoregulation
82-000717
Skeletal System
82-000078
Trichiurus haumela
Parasites/Diseases
82-001842
Trematodes
82-001842
Trichiurus lepturus
Foods/Feeding
82-000280
Trichogaster pectoralis
Spawning
82-002494
Triglidae
Taxonomy
82-001758
Trinectes maculatus
Oil
82-001139
Uegitglanis zammaranoi
Aggressive Behavior
82-000181
Umbra krameri
Karyotypes
82-000169
Umbra limi
Acanthocephala
82-002777
Air Breathing
82-000697
Neoechinorhynchus limi
82-002777
Paracreptotrematina limi
82-002751
Parasites/Diseases
82-002751
82-002777
Respiration
82-000697
Trematodes
82-002751
Urolophus jamaicensis
Life History/General
82-002452
Urophycis chuss
Life History/General
82-002429
Urophycis tenuis
Foods/Feeding
82-000905
Life History/General
82-002429
Valamugil seheli
Forticulcita glabra
82-002779
Parasites/Diseases
82-002779
Trematodes
82-002779
Vinciguerria
Fish Lists/Keys
82-002685
Identification/Larvae
82-002685
Xenojulis
Taxonomy
82-002706
Xenolepidichthys dalgleishi
Distribution/Geographical
82-000304
Xererpes fucorum
Foods/Feeding
82-001645
Xiphias gladius
Life History/General
82-000216
Xiphiidae
Age/Growth
82-001691
Xiphister atropurpureus
Foods/Feeding
82-001645
Xiphister mucosus
Foods/Feeding
82-001645

# SYSTEMATIC INDEX

...CONTINUED...

Xiphophorus
  Maturation
    82-001384
Xiphophorus maculatus
  Endocrinology
    82-001494
    82-002341
  Enzymes
    82-002321
  Hormones
    82-001495
  Reproduction
    82-001494
    82-001495
    82-002334
  Steroids
    82-002341
Xyrauchen texanus
  Movements
    82-000842
  Spawning
    82-000842
Xyrichthys novacula
  Endocrinology
    82-001522
Zacco temmincki
  Hormones
    82-002280
  Melanophores
    82-002280
Zanclus canascens
  Parasites/Diseases
    82-002772
  Parasitic Copepods
    82-002772
  Pennella diodontis
    82-002772
Zenarchopterus alleni
  New Species
    82-001752
Zenarchopterus robertsi
  New Species
    82-001752
Zoarces viviparus
  Diplostomum spathaceum
    82-001850
  Enzymes
    82-001444
  Parasites/Diseases
    82-001850
  Reproduction
    82-001444
  Steroids
    82-002332
  Trematodes
    82-001850
Zu cristatus
  Distribution/Geographical
    82-002621

## SUBJECT INDEX

Administrative Reports
  Can. Dep. Fish Oceans West. Reg./Bien. Rep. 1978-80
    82-002892
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    82-001952
Aquatic Plants
  Aquashade
    82-002062
  Aquatic Plant Control
    82-001296
    82-001593
  Control/Biological
    82-000001
    82-001542
    82-002050
  Control/Chemical
    82-002051
  Control/Dyes
    82-002062
  Control/2,4-D
    82-002051
  Hydrilla
    82-000001
  Nutrition
    82-000568
  Pond Culture
    82-002062
Behavior
  Activity Patterns
    82-000178
    82-000184
    82-000195
    82-000202
    82-000799
    82-000802
    82-000812
    82-000824
    82-000941
    82-001212
    82-001551
    82-001555
    82-002398

..CONTINUED...
Behavior
  Activity Patterns
    82-002403
    82-002411
  Aggressive Behavior
    82-000181
    82-000808
    82-002399
    82-002400
    82-002410
  Air Breathing
    82-000698
  Alarm Reaction
    82-000825
  Attacks on Humans
    82-001573
  Auditory Senses
    82-000175
    82-000176
    82-000203
    82-000666
    82-000794
    82-000823
    82-001553
    82-001558
    82-002396
  Brooding Behavior
    82-000876
    82-001549
    82-001578
    82-001587
    82-002491
  Buoyancy Adjustment
    82-000201
    82-000793
    82-001556
    82-001582
  Burrowing Behavior
    82-001547
    82-001565
  Camouflage
    82-001564
  Cannibalism
    82-000915
    82-002404
  Chemoreception
    82-000791
    82-000811
    82-001566
    82-001571
    82-001581
    82-002405
    82-002406
  Cleaning Behavior
    82-000180
    82-000807
    82-002401
    82-002707
  Coexistance
    82-000821
  Commensalism
    82-001565

# SUBJECT INDEX

...CONTINUED...
- Behavior
  - Commensalism
    - 82-002416
  - Communication
    - 82-000174
    - 82-000811
    - 82-001572
    - 82-002412
  - Competition
    - 82-000182
    - 82-000193
    - 82-000804
    - 82-000816
    - 82-000990
    - 82-001642
    - 82-001651
    - 82-001657
    - 82-002390
    - 82-002427
    - 82-002435
    - 82-002535
    - 82-002556
    - 82-002569
    - 82-002992
  - Death Feigning
    - 82-000190
  - Electric Organs
    - 82-001574
  - Electrical Communication
    - 82-000191
  - Electrolocation
    - 82-000188
  - Escape Behavior
    - 82-001548
    - 82-001588
  - Eye-Picking
    - 82-002400
  - Foods/Feeding
    - 82-000274
    - 82-001225
  - Fright Behavior
    - 82-001581
  - Habitat Selection
    - 00-000000
    - 82-000197
    - 82-000206
    - 82-000227
    - 82-000792
    - 82-000812
    - 82-000816
    - 82-000867
    - 82-000906
    - 82-000963
    - 82-000975
    - 82-001271
    - 82-001550
    - 82-001560
    - 82-001569
    - 82-002392

...CONTINUED...
- Behavior
  - Habitat Selection
    - 82-002395
    - 82-002397
    - 82-002408
    - 82-002415
    - 82-002424
    - 82-002435
    - 82-002554
    - 82-002622
    - 82-002992
  - Larval Behavior
    - 82-002402
  - Learning
    - 82-000819
    - 82-002419
  - Locomotion
    - 82-000179
    - 82-000204
    - 82-000651
    - 82-001517
    - 82-001585
    - 82-002413
  - Memory
    - 82-000819
  - Misc. Behavior
    - 82-000803
  - Morpholine
    - 82-000189
  - Olfaction
    - 82-000815
    - 82-001572
    - 82-002412
  - Orientation/Homing
    - 82-000185
    - 82-000189
    - 82-000811
    - 82-000863
    - 82-000889
    - 82-001552
    - 82-001579
    - 82-002393
    - 82-002520
  - Pheromones
    - 82-000795
    - 82-000796
    - 82-000811
    - 82-000879
    - 82-000880
    - 82-001559
    - 82-001572
    - 82-001601
    - 82-002412
  - Photoperiodism
    - 82-001387
  - Phototropism
    - 82-000809
    - 82-002402
  - Rheotropism
    - 82-000186
    - 82-000187

# SUBJECT INDEX

...CONTINUED...

- Behavior
  - Rheotropism
    - 82-001577
  - Schooling Behavior
    - 82-000161
    - 82-000194
    - 82-000797
    - 82-000806
    - 82-000811
    - 82-001554
  - Social Behavior
    - 82-001630
    - 82-002263
  - Sound Production
    - 82-000064
    - 82-000174
  - Spawning Behavior
    - 82-000248
    - 82-000249
    - 82-001623
    - 82-001625
    - 82-001626
    - 82-001629
    - 82-002418
    - 82-002481
    - 82-002493
    - 82-002497
  - Spawning Migration
    - 82-000889
  - Startle Response
    - 82-000175
    - 82-000176
    - 82-001557
  - Swimming Performance
    - 82-000826
    - 82-000828
    - 82-000829
    - 82-001400
    - 82-001563
    - 82-001570
    - 82-001576
    - 82-001585
    - 82-001586
    - 82-002409
  - Taste Reception
    - 82-000601
    - 82-002405
  - Techniques/Feeding Experiments
    - 82-000199
    - 82-000200
  - Techniques/Schooling
    - 82-001583
    - 82-002389
  - Techniques/Scuba
    - 82-000813
  - Temperature Selection
    - 82-000177
    - 82-000196
    - 82-000652

...CONTINUED...

- Behavior
  - Temperature Selection
    - 82-000798
    - 82-000799
    - 82-000817
    - 82-000820
    - 82-000822
    - 82-000893
    - 82-001108
    - 82-001439
    - 82-001486
    - 82-001561
    - 82-001567
    - 82-001568
    - 82-001584
    - 82-002394
    - 82-002411
    - 82-002417
  - Territorial Behavior
    - 82-000198
    - 82-000269
    - 82-000801
    - 82-000808
    - 82-000818
  - Vision
    - 82-000599
    - 82-000800
    - 82-000802
    - 82-000805
    - 82-000810
    - 82-001366
    - 82-001580
    - 82-002391
    - 82-002414
- Bibliographies
  - Africa: Lake Tanganyika
    - 82-003037
  - Can. Dep. Fish. Oceans West. Reg./Publ. 1978-79
    - 82-000502
  - Clarias
    - 82-002049
  - Culture/Propagation
    - 82-002053
  - Fishery Literature
    - 82-001276
    - 82-002046
  - Fishery Textbooks
    - 82-002045
  - Forestry Practices
    - 82-001171
  - Index/Hydrobiologia Vol. 1-75
    - 82-002048
  - Lake Tanganyika
    - 82-003037
  - Marine Sciences Textbooks
    - 82-001279
  - Mercenaria mercenaria
    - 82-002047
  - Nigeria/Lake Kainji
    - 82-003038

# SUBJECT INDEX

...CONTINUED...
Bibliographies
  Paralichthys dentatus
    82-001277
  Parasites/Diseases
    82-001782
  Prague Lab. Fish. Res. Hydrobiol./1969-1978
    82-003039
  South Africa
    82-001275
Culture/Propagation--Coldwater
  Amino Acids
    82-000006
  Cage Culture
    82-002058
  Diets
    82-000029
    82-000031
    82-001316
    82-001321
    82-002085
    82-002090
    82-002092
  Feeders
    82-001324
    82-002093
  Feeding Experiments
    82-000031
    82-000561
    82-000563
    82-001315
    82-001316
    82-001320
    82-001321
    82-001323
    82-001328
    82-002085
    82-002090
    82-002092
  Feeds
    82-000544
    82-000554
    82-001320
    82-001328
    82-001330
  Fertilization/Soil and Water
    82-000006
  Filtration Systems
    82-001338
  Fingerling Production
    82-000519
  Fish Hatchery Effluents
    82-002058
  Fish Stocks
    82-000517
  General
    82-000520
    82-001283
    82-002944

...CONTINUED...
Culture/Propagation--Coldwater
  Genetic Strains
    82-000517
  Growth
    82-000518
    82-002057
  Growth Stimulants
    82-000521
    82-000522
  Hybridization
    82-001535
  Induced Maturation
    82-000007
    82-000008
    82-000009
    82-001285
  Invertebrate Forage
    82-000465
    82-000554
  Lake Culture
    82-000516
  Nutrition
    82-000006
    82-000029
    82-000561
    82-000563
  Ocean Ranching
    82-000012
    82-001284
  Pigmenters
    82-000011
  Polyculture
    82-000518
  Recirculating Systems
    82-001338
    82-001342
  Sterilization
    82-000515
  Transportation
    82-000565
    82-001331
Culture/Propagation--General
  Aeration
    82-001334
    82-001335
    82-001341
  Alaska
    82-001280
  Aquariums
    82-002102
    82-002961
  Arkansas
    82-000507
  Asia, Southeastern
    82-000513
  Bibliographies
    82-002053
  Cage Culture
    82-002104

...CONTINUED...
Culture/Propagation--General
California
82-001282
Computer Applications
82-002110
Economic Values
82-000004
Extension Services
82-000506
Feeds
82-000028
82-000556
Fish Hatchery Effluents
82-001106
82-001110
82-001864
Fishery Textbooks
82-001279
82-002045
Gamete Storage
82-002107
General
82-001278
82-002052
82-002053
82-002112
Genetic Strains
82-000508
Hatchery Design
82-000510
Heated Water
82-000141
82-000505
82-000573
Induced Maturation
82-000005
Invertebrate Culture
82-000509
82-002103
Invertebrate Forage
82-000509
Israel
82-001281
82-002055
Italy
82-000002
Japan
82-000510
Maine
82-000003
Mississippi
82-000535
Monosex Culture
82-000570
North America
82-000514
Pond Culture
82-000503
82-001339

...CONTINUED...
Culture/Propagation--General
Production
82-002112
Selective Breeding
82-000508
Techniques/Flow Controllers
82-000571
Techniques/Solar Heating
82-000573
Techniques/Water Quality
82-000511
Terminology
82-002054
Transportation
82-000038
82-000039
82-002099
Water Quality
82-000503
82-001339
Culture/Propagation--Invertebrates
Copepods
82-000509
Crayfish
82-000504
Culture/Propagation--Marine
Feeds
82-001318
Abnormalities
82-002073
Baitfish Culture
82-002076
Cage Culture
82-001306
82-001308
Cannibalism
82-000013
Diets
82-000558
82-002080
82-002081
Egg Collection
82-002108
Feeders
82-002095
Feeding Experiments
82-000545
82-000546
82-000547
82-000549
82-000558
82-001311
82-001317
82-001318
82-001319
82-001329
82-002080
82-002088
82-002091

## SUBJECT INDEX

...CONTINUED...
Culture/Propagation--Marine
  Feeds
    82-000033
    82-000546
    82-000549
    82-000558
    82-001319
    82-001329
    82-002091
  Fingerling Production
    82-000539
    82-000545
    82-000547
  Fry Production
    82-002075
  Gamete Storage
    82-001336
  General
    82-000026
  General/India
    82-003009
  General/Japan
    82-000023
  General/New York: Long Island
    82-001307
  Growth
    82-001317
  Heated Water
    82-001309
    82-002076
  Holding Facilities
    82-000540
  Induced Maturation
    82-000027
    82-002059
  Invertebrate Forage
    82-000024
  Larvae
    82-000025
  Nutrition
    82-000033
    82-001318
    82-002081
  Pond Culture
    82-001305
  Recirculating Systems
    82-000541
    82-002074
  Tank Culture
    82-000014
  Techniques/Tidal Power
    82-000025
  Transportation
    82-002100
    82-002101
Culture/Propagation--Warmwater
  Abnormalities
    82-002152
  Aeration
    82-001340

...CONTINUED...
Culture/Propagation--Warmwater
  Ammonia
    82-000438
    82-002071
  Aquariums
    82-001333
  Aquashade
    82-002062
  Baitfish Culture
    82-001300
    82-002067
  Biofiltration
    82-000537
  Brood Stock
    82-001288
  Cage Culture
    82-000524
    82-000525
    82-001295
  Diets
    82-000543
    82-000550
    82-000557
    82-000564
    82-002079
    82-002089
  Economics
    82-002067
  Egg Collection
    82-002069
  Feeding Experiments
    82-000036
    82-000533
    82-000542
    82-000546
    82-000550
    82-000553
    82-000555
    82-000559
    82-000560
    82-000562
    82-001302
    82-001303
    82-001310
    82-001312
    82-001313
    82-001314
    82-001322
    82-001325
    82-001326
    82-001327
    82-002077
    82-002078
    82-002079
    82-002082
    82-002084
    82-002089
    82-002094
    82-002098

## SUBJECT INDEX

...CONTINUED...

Culture/Propagation--Warmwater
- Feeds
  - 82-000036
  - 82-000542
  - 82-000543
  - 82-000555
  - 82-000557
  - 82-000559
  - 82-000560
  - 82-000564
  - 82-001303
  - 82-001310
  - 82-001312
  - 82-001314
  - 82-001325
  - 82-001326
  - 82-001327
  - 82-002077
  - 82-002082
  - 82-002094
  - 82-002098
- Fertilization/Soil and Water
  - 82-001215
- Filtration Systems
  - 82-000538
- Fingerling Production
  - 82-000019
  - 82-000020
  - 82-000022
  - 82-000533
  - 82-001286
  - 82-001290
  - 82-001298
- Fish Grading
  - 82-000529
- Fry Production
  - 82-001297
  - 82-001298
- Gamete Storage
  - 82-000574
  - 82-001337
- General
  - 82-000016
  - 82-002063
  - 82-002065
- General/Asia: Southeastern
  - 82-000513
- General/China
  - 82-000530
- General/Israel
  - 82-002070
- General/Nigeria
  - 82-002064
- Genetic Strains
  - 82-000528
  - 82-001293
  - 82-001302
  - 82-001531
- Growth
  - 82-001293

...CONTINUED...

Culture/Propagation--Warmwater
- Growth
  - 82-001303
- Growth Stimulants
  - 82-000531
  - 82-001287
- Hatchery Design
  - 82-002060
- Heated Water
  - 82-000542
- Hormones
  - 82-000526
- Hybridization
  - 82-001294
  - 82-001299
  - 82-002072
- Hydroponics
  - 82-000537
- Incubators
  - 82-002060
- Induced Maturation
  - 82-000021
  - 82-000526
  - 82-000536
  - 82-001299
  - 82-002061
  - 82-002109
- Laboratory Spawning
  - 82-001297
- Monosex Culture
  - 82-001542
  - 82-002105
- Nutrition
  - 82-000551
  - 82-000562
  - 82-001313
  - 82-001322
  - 82-002078
  - 82-002089
- Polyculture
  - 82-000015
  - 82-000523
  - 82-000530
  - 82-001291
- Polyploidy
  - 82-000532
- Pond Culture
  - 82-000019
  - 82-000020
  - 82-000527
  - 82-000528
  - 82-000534
  - 82-001215
  - 82-001286
  - 82-001290
  - 82-001292
  - 82-001340
  - 82-002062
  - 82-002066
  - 82-002068
  - 82-002070

...CONTINUED...
Culture/Propagation--Warmwater
  Pond Culture
    82-002071
  Raceway Culture
    82-000017
  Rearing Capacity
    82-000527
  Recirculating Systems
    82-000530
  Selective Breeding
    82-000524
    82-001293
  Sewage Effluents
    82-000396
    82-000404
    82-000415
    82-000416
  Sex Reversal
    82-000572
  Steroids
    82-000526
  Tank Culture
    82-000527
  Taste and Odor Problems
    82-001289
  Transportation
    82-000566
    82-000567
    82-001332
Endangered/Threatened Species
  Arizona
    82-001158
    82-001162
  Denmark
    82-000966
  General
    82-001156
  Gila
    82-000986
  Gila bicolor mohavensis
    82-001173
  North Dakota
    82-001717
  Peociliopsis occidentalis occidentalis
    82-000327
  Poeciliidae
    82-001162
  Salmo apache
    82-001165
  Salmo gilae
    82-001165
  United States, Southwestern
    82-002877
Environmental Factors
  Calcium
    82-001895
  Currents
    82-000187
    82-000812

...CONTINUED...
Environmental Factors
  Cyclones
    82-001990
  Eutrophication
    82-001235
  Floods
    82-000327
    82-000987
    82-003004
  Flow Regimes
    82-000843
    82-000988
    82-001743
    82-002014
    82-002985
  Gas Supersaturation
    82-000672
    82-002039
  General
    82-002589
    82-002646
  Geothermal Effects
    82-001528
  Gradient
    82-001569
  Hydrostatic Pressure
    82-000260
    82-002398
  Light
    82-000021
    82-000088
    82-000134
    82-000299
    82-000599
    82-000704
    82-000802
    82-000809
    82-000812
    82-000824
    82-000946
    82-002402
    82-002411
    82-002413
  Lunar Influences
    82-001567
    82-002403
  Oxygen
    82-001430
    82-001575
    82-002288
  pH
    82-000411
    82-000705
    82-001895
    82-002315
    82-002848
  Reservoir Release Effects
    82-002521
  Salinity
    82-000102

...CONTINUED...
- Environmental Factors
  - Salinity
    - 82-000121
    - 82-000330
    - 82-000637
    - 82-000639
    - 82-000753
    - 82-001030
    - 82-001431
    - 82-001465
    - 82-001886
    - 82-002238
    - 82-002324
    - 82-002362
    - 82-002665
  - Solar Eclipses
    - 82-000814
  - Temperature
    - 82-000021
    - 82-000082
    - 82-000088
    - 82-000099
    - 82-000105
    - 82-000107
    - 82-000109
    - 82-000114
    - 82-000140
    - 82-000141
    - 82-000150
    - 82-000177
    - 82-000196
    - 82-000249
    - 82-000330
    - 82-000647
    - 82-000649
    - 82-000652
    - 82-000677
    - 82-000679
    - 82-000694
    - 82-000700
    - 82-000731
    - 82-000737
    - 82-000747
    - 82-000798
    - 82-000799
    - 82-000812
    - 82-000817
    - 82-000822
    - 82-000829
    - 82-000843
    - 82-000897
    - 82-000946
    - 82-001030
    - 82-001091
    - 82-001305
    - 82-001349
    - 82-001363
    - 82-001401
    - 82-001403

...CONTINUED...
- Environmental Factors
  - Temperature
    - 82-001427
    - 82-001439
    - 82-001440
    - 82-001454
    - 82-001460
    - 82-001461
    - 82-001465
    - 82-001490
    - 82-001496
    - 82-001497
    - 82-001499
    - 82-001503
    - 82-001506
    - 82-001512
    - 82-001551
    - 82-001561
    - 82-001566
    - 82-001567
    - 82-001568
    - 82-001584
    - 82-001592
    - 82-001673
    - 82-001700
    - 82-001741
    - 82-002232
    - 82-002243
    - 82-002255
    - 82-002274
    - 82-002285
    - 82-002288
    - 82-002346
    - 82-002361
    - 82-002394
    - 82-002411
    - 82-002417
    - 82-002526
    - 82-002530
    - 82-002625
    - 82-002665
    - 82-002667
  - Turbidity
    - 82-001105
    - 82-001562
    - 82-001957
    - 82-002547
  - Upwelling
    - 82-000954
    - 82-002662
  - Volcanic Ash
    - 82-000827
  - Weather
    - 82-001990
  - Wind
    - 82-001990
    - 82-001991
    - 82-002541
- Fish Control/Removal
  - Chemical Reclamation
    - 82-001187

## SUBJECT INDEX

...CONTINUED...

- Fish Control/Removal
  - Chemical Reclamation
    - 82-002930
    - 82-002984
  - Lamprey Control
    - 82-000459
    - 82-001943
  - Management/Research--Lakes
    - 82-002005
  - Sterilization
    - 82-000459
- Fish Kills
  - Economic Values
    - 82-001887
  - Heavy Metals
    - 82-000420
  - Recovery
    - 82-002822
  - Salinity
    - 82-001886
  - Summerkill
    - 82-002821
  - Winterkill
    - 82-002821
- Fish Lists/Keys
  - Alabama: Mobile Bay: Mississippi Sound
    - 82-003002
  - Antarctic Peninsula
    - 82-000964
  - Arizona: Bill Williams Drainage
    - 82-002631
    - 82-002632
  - Arizona: Hassayampa Drainage
    - 82-002632
  - Arkansas: Saline River
    - 82-002647
  - Atlantic Ocean, North
    - 82-001739
  - Atlantic Ocean, North: Saint Paul's Rocks
    - 82-000965
  - Atlantic Ocean, West Central
    - 82-002651
  - Australia: Great Australian Bight
    - 82-000316
    - 82-002655
  - Australia: Queensland
    - 82-000320
  - Australia: Western Australia
    - 82-002628
  - Bering Sea
    - 82-001729
  - Borneo
    - 82-002692
  - California: Sacramento-San Joaquin Estuary
    - 82-001774
  - California: Sacramento-San Joaquin System
    - 82-002639

...CONTINUED...

- Fish Lists/Keys
  - Canada: James Bay
    - 82-000314
  - Canada: Ontario: Bruce Peninsula
    - 82-000308
  - Caroline Islands: Palau
    - 82-001703
  - China: Xizang
    - 82-001719
  - Chondrichthyes
    - 82-001709
  - Dactyloscopidae
    - 82-001006
  - Easter Island
    - 82-002658
  - Echeneidae
    - 82-002641
  - El Salvador: Jiquilisco Bay
    - 82-001722
  - France: Rhone River
    - 82-000319
  - Gerreidae
    - 82-002679
  - India: Jammu Province
    - 82-002630
  - India: Punjab
    - 82-002629
  - Indian Ocean
    - 82-000305
  - Indiana: Posey Cty.
    - 82-000972
  - Indiana: St. Joseph River
    - 82-000974
  - Japan: Ryukyu Islands
    - 82-002645
  - Kansas
    - 82-000975
    - 82-002618
  - Kentucky
    - 82-001736
  - Kenya: Uaso Ngiro
    - 82-001705
  - Lake Huron
    - 82-001618
  - Louisiana: Barataria Basin
    - 82-001210
  - Louisiana: Grand Isle
    - 82-002687
  - Louisiana: Wilkinson Cty.: Thompson Creek
    - 82-000969
  - Lutjanidae
    - 82-000978
  - Maine: Gulf of Maine
    - 82-000304
  - Maine: Sheepscot River Estuary
    - 82-000983
  - Malawi
    - 82-002653

## SUBJECT INDEX

...CONTINUED...
Fish Lists/Keys
Malaysia: Selangor
82-002638
Maryland: Allegany Cty.: Town Creek
82-000967
Maryland: North Branch Potomac River
82-001096
Mexico: Campeche: Terminos Lagoon
82-002613
Mexico: Pacific Ocean
82-002657
Mexico: Sinaloa: Huizache-Caimanero Lagoon
82-002612
Mexico: Terminos Lagoon
82-002616
Minnesota
82-001721
Missouri River
82-002987
Mozambique
82-000305
Mugilidae
82-000997
Nepal
82-001727
Netherlands Antilles
82-000976
Nevada: Pyramid Lake
82-002654
Nevada: Railroad Valley
82-000985
New Zealand
82-002641
North Carolina
82-000981
82-001726
North Dakota, North Central
82-001734
North Dakota, Northeastern
82-001708
North Dakota, Northwestern
82-001733
North Dakota, South Central
82-001732
North Dakota, Southeastern
82-001731
North Sea
82-001739
Oklahoma: Mayes Cty.: Grand River
82-000309
Pacific Ocean
82-002628
82-002657
Pacific Ocean: Great Australian Bight
82-002655
Paleontology
82-002637
Pennsylvania: Bedford Cty.: Town Creek
82-000967

...CONTINUED...
Fish Lists/Keys
Petromyzonidae
82-002708
Philippines
82-000317
Pomadasys
82-001013
Saint Paul's Rocks
82-000965
Saurida
82-002712
Scotland: Forth Area
82-000973
Serranidae
82-000978
South Africa: Gamtoos Estuary
82-001713
South Africa: Holgat Estuary
82-001712
South Africa: Kosi
82-001702
South Africa: Uilkraals Estuary
82-001711
South Carolina
82-000963
82-001726
South Carolina: Santee River
82-001737
Spain
82-001009
Texas
82-001709
Texas: Galveston
82-000968
Utah: White River
82-000312
Vinciguerria
82-002685
Virginia: Shenandoah River
82-000971
West Germany: Danube River
82-000324
West Germany: Schleswig-Holstein
82-000970
West Virginia: North Branch Potomac River
82-001096
82-001100
Yugoslavia: Topla River
82-002633
Fish Passage
Dams
82-001995
Fish Counters
82-001219
Fishways
82-001995
Impingement/Entrainment
82-001092

...CONTINUED...
Fish Passage
  Impingement/Entrainment
    82-001217
    82-001218
    82-001220
    82-001996
    82-002965
  Power Plants
    82-001092
    82-001217
    82-001218
    82-001220
    82-001996
    82-002965
  Screens
    82-000478
    82-002964
Fishing Gear
  Baits/Baiting
    82-002955
  Chemicals
    82-001989
    82-002948
  Crab Pots
    82-001993
  Electrofishing
    82-000473
    82-001983
    82-002948
    82-002959
  Gear Selectivity
    82-001982
    82-002946
    82-002949
  General
    82-001209
    82-001992
    82-002961
  General/Virgin Islands
    82-000472
  Hooks
    82-002957
  Hydraulic Dredges
    82-002951
  Larval Fish
    82-001984
  Lights
    82-002956
  Longlines
    82-001206
    82-001213
    82-001986
  Modeling
    82-001211
  Monofilament
    82-002962
  Nets/Fry
    82-000475
    82-001212

...CONTINUED...
Fishing Gear
  Nets/Fry
    82-001984
  Nets/General
    82-001208
  Nets/Gill Nets
    82-001985
    82-001990
    82-002946
    82-002950
  Nets/Hoop Nets
    82-001987
    82-002955
  Nets/Purse Seines
    82-000471
  Nets/Seines
    82-001265
    82-001983
    82-002947
  Nets/Trap Nets
    82-001982
    82-002949
    82-002958
    82-002960
  Nets/Trawls
    82-000474
    82-001204
    82-001205
    82-001207
    82-001988
    82-001991
    82-001999
    82-002952
    82-002953
    82-002954
  Nets/Wegener Ring
    82-001210
  Pumps
    82-001984
  Rotenone
    82-001989
    82-002948
  Traps/Minnow Traps
    82-000470
  Traps/Misc.
    82-000477
    82-001986
Genetics
  Age/Growth
    82-000160
    82-000167
    82-001252
    82-002379
  Egg Size
    82-000773
  Electrophoresis
    82-000148
    82-000163
    82-000163
    82-000170
    82-000173

...CONTINUED...
Genetics
  Electrophoresis
    82-000345
    82-000359
    82-000761
    82-000764
    82-000765
    82-000768
    82-000769
    82-000772
    82-000775
    82-000777
    82-000785
    82-000788
    82-000837
    82-001027
    82-001525
    82-001528
    82-001531
    82-001532
    82-001540
    82-001541
    82-001543
    82-001756
    82-002017
    82-002377
    82-002383
    82-002699
  Enzymes
    82-002377
  Fish Stocks
    82-000761
    82-000762
    82-000763
    82-000764
    82-000767
    82-000772
    82-000779
    82-000780
    82-000783
    82-000784
    82-000837
    82-001169
    82-001253
  General
    82-001526
    82-002387
  Genetic Strains
    82-000764
    82-000778
    82-001293
    82-001541
    82-001584
    82-002017
  Gynogenesis
    82-000782
    82-002385
  Hybridization
    82-000159

...CONTINUED...
Genetics
  Hybridization
    82-000165
    82-000166
    82-000770
    82-000773
    82-000781
    82-000786
    82-000787
    82-001255
    82-001299
    82-001529
    82-001534
    82-001535
    82-001536
    82-001538
    82-002015
    82-002373
    82-002378
    82-002383
    82-002386
    82-002549
    82-002995
  Karyotypes
    82-000162
    82-000164
    82-000168
    82-000169
    82-000171
    82-000774
    82-001005
    82-001524
    82-001539
    82-001546
    82-002376
  Malate Dehydrogenase
    82-000766
  Maturation
    82-000160
  Movements
    82-002382
  Polymorphism
    82-001530
  Polyploidy
    82-000789
  Population Genetics
    82-000763
    82-000776
    82-000780
    82-002375
  Population Studies
    82-000761
  Selective Breeding
    82-001293
  Sex Determination
    82-000164
    82-000570
    82-000771
    82-001533
    82-001741
  Sex Reversal
    82-001542

...CONTINUED...
Genetics
  Sex Reversal
   82-002105
  Speciation
   82-000785
   82-001539
   82-002713
  Swimming Performance
   82-000158
  Techniques/Biopsy
   82-001532
  Triploid Fish
   82-000166
   82-000172
   82-000789
   82-000790
   82-002384
   82-002388
  Unisex Populations
   82-002384
   82-002385
   82-002682
  Variation Studies
   82-000161
   82-000163
   82-000163
   82-000170
   82-000767
   82-000768
   82-000769
   82-000772
   82-000775
   82-000777
   82-000778
   82-000779
   82-000785
   82-000788
   82-000837
   82-001005
   82-001198
   82-001523
   82-001525
   82-001527
   82-001537
   82-001544
   82-001545
   82-002374
   82-002375
   82-002380
   82-002381
Habitat Alterations
  Aeration
   82-001175
  Artificial Reefs
   82-002568
   82-002894
   82-002897
   82-002898
   82-002903

...CONTINUED...
Habitat Alterations
  Artificial Reefs
   82-002904
   82-002908
   82-002909
   82-002911
   82-002912
   82-002913
  Artificial Spawning Beds
   82-000483
   82-002010
   82-002901
  Boat Turbidity
   82-001957
  Channelization
   82-001965
   82-002907
  Chemical Reclamation
   82-001187
  Clearcutting
   82-001960
  Dams
   82-001963
  Dredging
   82-002899
   82-002900
   82-002910
   82-003002
  Explosives
   82-001179
  Flotsam
   82-001271
  Flow Regimes
   82-000331
   82-000798
   82-001247
   82-001955
   82-001962
   82-002895
   82-002902
   82-002907
  Forestry Practices
   82-001171
   82-001960
  General
   82-001176
  Gravel Cleaning
   82-000485
  Grazing
   82-001177
   82-002905
   82-002989
   82-002991
  Impoundment
   82-000040
   82-000451
   82-001246
   82-001955
   82-001956
   82-001965
   82-002986

...CONTINUED...
Habitat Alterations
  Impoundment
    82-002988
  Midwater Structures
    82-000494
    82-001178
  Mosquito Control
    82-001956
  Offshore Drilling
    82-002896
  Pumped Storage
    82-000452
    82-001172
    82-001954
    82-001959
    82-001961
  Reservoir Release Effects
    82-000146
    82-000453
    82-001962
    82-001965
    82-002902
    82-002986
  Road Construction
    82-001174
    82-001953
  Stream Improvement/General
    82-001953
    82-001958
    82-001964
    82-002893
    82-002906
  Stream Relocation
    82-001953
  Urban Development
    82-001174
  Water Diversions
    82-001965
  Water Level Fluctuations
    82-000331
    82-001170
    82-001966
Invertebrates
  Corbicula fluminea
    82-000015
  Culture/Propagation
    82-002103
  Daphnia
    82-002103
  Fenitrothion
    82-000419
  Fluridone
    82-002806
  Forage Introductions
    82-000465
  Gammarus lacustris
    82-000465
  Heavy Metals
    82-001911

...CONTINUED...
Invertebrates
  Heavy Metals
    82-002814
    82-002845
  Herbicides
    82-002806
  Hydraulic Dredges
    82-002951
  Insecticides
    82-000419
    82-001882
  Mercenaria mercenaria
    82-002047
  Mollusks
    82-000582
    82-002047
  Mysis
    82-002558
  Mysis relicta
    82-000580
    82-000586
    82-001350
  Nicotine
    82-002840
  Ocean Dumping
    82-002817
  Orconectes obscurus
    82-001349
  pH
    82-001911
  Piscicides
    82-002870
  Polypedilum
    82-000328
  Predator/Prey Relationships
    82-000995
    82-002531
    82-002532
    82-002564
    82-002573
  Preservation
    82-000583
  Reservoir Release Effects
    82-000453
    82-002985
  Sewage Effluents
    82-002817
  Silver
    82-002845
  Surfactants
    82-001133
  Temperature
    82-001349
  Terbutryn
    82-002806
  Water Level Fluctuations
    82-000581
Limnology
  Benthos
    82-000042
    82-000487

...CONTINUED...
Limnology
  Benthos
    82-002047
    82-002119
  Chemical
    82-002118
  Currents
    82-002115
  Eutrophication
    82-001343
    82-002012
  General
    82-000040
    82-000575
    82-000576
    82-000577
    82-001164
    82-002111
    82-002996
  Hydraulics
    82-002113
  Invertebrate Drift
    82-001348
  Morphoedaphic Index
    82-001345
  Morphometry
    82-001345
  Nutrient Cycling
    82-000041
  Nutrients
    82-000568
    82-000579
    82-001346
    82-001347
    82-002999
  Oxygen
    82-002116
  Paleolimnology
    82-001343
  Phosphorus
    82-000041
    82-000568
    82-000579
    82-001346
    82-001347
    82-002999
  Phytoplankton
    82-000587
  Primary Production
    82-001352
  Salinity
    82-001339
  Techniques/Alkalinity
    82-002118
  Techniques/Benthos
    82-000583
    82-002120
  Techniques/Oxygen
    82-002117

...CONTINUED...
Limnology
  Techniques/Periphyton
    82-000043
  Temperature
    82-001339
    82-002114
  Trophic Status
    82-000578
  Zooplankton
    82-000584
    82-001351
    82-002979
Management/Research--Estuari
  Creel Census
    82-000455
  Dredging
    82-003002
  Floods
    82-003004
  General
    82-000492
    82-000493
    82-001262
    82-001264
    82-003005
    82-003006
    82-003007
  Ivory Coast
    82-002018
  Mitigation
    82-003001
  Nursery Areas
    82-000839
  Population Studies
    82-001261
    82-002613
    82-003003
  Sampling
    82-001989
  Texas
    82-001951
Management/Research--General
  Administration
    82-000447
  American Fisheries Society
    82-000450
  Colorado
    82-000448
  Commercial Fishing
    82-001181
    82-001184
    82-001967
  Computer Applications
    82-003035
  Creel Census
    82-001961
  Czechoslovakia
    82-002891
  Dingell-Johnson Program
    82-001167

## SUBJECT INDEX

...CONTINUED...
Management/Research--General
  Economic Values
    82-001180
    82-001184
  Educational Programs
    82-002876
  Endangered/Threatened Species
    82-001169
  Exploitation Rates
    82-002882
  Fish and Wildlife Coordination Act
    82-000446
  Fish Stocks
    82-000784
    82-001154
    82-001155
    82-001159
    82-001160
    82-001168
  Fisherman Surveys
    82-000457
  Fishery Literature
    82-002876
  Fishery Textbooks
    82-001163
  Forage Introductions
    82-000463
    82-000464
    82-000466
    82-000469
  General
    82-000444
    82-001153
    82-001155
    82-001157
    82-001161
    82-001164
    82-001945
    82-001946
    82-001947
    82-002872
    82-002875
    82-002878
    82-002881
    82-002883
    82-002884
  Growth Stimulants
    82-000512
  Habitat Evaluation
    82-002880
  Habitat Rating Systems
    82-002880
  Harvest
    82-001181
    82-001967
  Hooking Mortality
    82-002874
  Induced Maturation
    82-000512

...CONTINUED...
Management/Research--General
  Israel
    82-001281
  Jurisdiction
    82-002878
  Law Enforcement
    82-001972
  Maximum Sustainable Yield
    82-002873
  Mitigation
    82-003001
  Monosex Culture
    82-000512
  Optimum Sustainable Yield
    82-002002
  Perspectives
    82-002881
  Planning
    82-002885
  Population Studies
    82-000445
    82-001155
  Sri Lanka
    82-001166
Management/Research--Lakes
  Artificial Spawning Beds
    82-000483
    82-002010
  Chemical Reclamation
    82-001187
    82-002930
  Egypt: Lake Quarun
    82-002978
  Eutrophication
    82-001235
    82-002012
  Exploitation Rates
    82-001242
    82-002008
  Fertilization/Soil and Water
    82-000476
    82-001216
    82-001994
    82-002552
    82-002963
  Finland
    82-001240
  Fish Control/Removal
    82-002005
  Fish Stocks
    82-000767
    82-000768
    82-000775
    82-001229
    82-001230
    82-001231
    82-001236
  General
    82-001231

...CONTINUED...
Management/Research--Lakes
General
82-001242
82-002980
Great Lakes
82-000767
82-000775
82-001229
82-001231
82-001232
82-001236
82-001618
82-002886
82-002887
82-002982
Harvest
82-001234
82-001968
Lake Rennovation
82-002012
Liming
82-001994
Morphoedaphic Index
82-001237
82-001239
82-001241
82-001243
Nigeria/Lake Kainji
82-003038
Population Studies
82-000308
82-000484
82-001228
82-001234
82-001238
82-001618
82-002006
82-002461
82-002463
Regulations/Size Limits
82-002460
Stocking/Introductions
82-002942
Trophic Relationships
82-001234
Management/Research--Marine
Adriatic Sea
82-002022
Aritificial Reefs
82-002898
Artificial Reefs
82-002568
82-002894
82-002897
82-002903
82-002904
82-002908
82-002909
82-002912

...CONTINUED...
Management/Research--Marine
Artificial Reefs
82-002913
Atlantic Ocean
82-001266
82-002030
Atlantic Ocean, East Central
82-002024
Commercial Fisheries
82-001185
Commercial Fishing
82-001182
82-001183
82-001265
82-002919
82-003018
Commericial Fishing
82-003019
Economic Values
82-000454
82-000456
82-001221
82-001969
82-001970
Exploitation Rates
82-003015
Fisherman Surveys
82-001182
82-002026
Flotsam
82-001271
Forecasting
82-000481
82-002031
General
82-001266
82-001267
82-001268
82-002021
82-002028
82-002032
82-003008
82-003010
82-003011
82-003012
82-003014
82-003024
General/India
82-003019
Harvest
82-000495
82-001183
82-001185
82-002919
82-003019
Incubators
82-002106
Indian Ocean
82-002023
Jurisdiction
82-003022

## SUBJECT INDEX

...CONTINUED...

- Management/Research--Marine
  - Management Decisions
    - 82-000481
  - Maximum Sustainable Yield
    - 82-002019
  - Mediterranean Sea
    - 82-002025
  - Midwater Structures
    - 82-000494
  - Population Studies
    - 82-000222
  - Regulations/Fishing Gear
    - 82-002035
  - Regulations/General
    - 82-002926
  - Regulations/Limited Entry
    - 82-000458
    - 82-001971
  - Stocking/Introductions
    - 82-002941
  - Texas
    - 82-001951
- Management/Research--Ponds
  - Fertilization/Soil and Water
    - 82-001214
  - General/Kansas
    - 82-002994
  - Hybrid Fish
    - 82-001255
    - 82-002015
    - 82-002995
  - Liming
    - 82-001214
    - 82-002016
  - Population Studies
    - 82-000225
    - 82-001254
    - 82-002016
  - Regulations/General
    - 82-002929
  - Stocking/Introductions
    - 82-002997
  - Supplemental Feeding
    - 82-002993
  - Texas
    - 82-001254
- Management/Research--Reservoirs
  - Aeration
    - 82-001175
  - Aquatic Plant Control
    - 82-002051
  - Artificial Spawning Beds
    - 82-002901
  - Chemical Reclamation
    - 82-001187
  - Drawdown
    - 82-001966
  - Economic Values
    - 82-001186

...CONTINUED...

- Management/Research--Reservoirs
  - Forage Introductions
    - 82-000467
    - 82-001175
    - 82-001259
  - General
    - 82-002111
  - Harvest
    - 82-001234
    - 82-002996
  - Limnology
    - 82-000576
  - Midwater Structures
    - 82-001178
  - Morphoedaphic Index
    - 82-001258
  - Population Studies
    - 82-000451
    - 82-000489
    - 82-001234
    - 82-001256
    - 82-002473
  - Pre-Impoundment Studies
    - 82-000491
  - Production
    - 82-000490
    - 82-002999
  - Regulations/Size Limits
    - 82-002928
  - Reservoir Release Effects
    - 82-001257
    - 82-002014
  - Stocking/Introductions
    - 82-001200
    - 82-002938
    - 82-002945
    - 82-002996
  - Tailwaters
    - 82-001246
    - 82-001257
  - Trophic Relationships
    - 82-001234
  - Two-Story Fisheries
    - 82-003000
  - Water Level Fluctuations
    - 82-000581
    - 82-001966
- Management/Research--Rivers and Streams
  - Boat Turbidity
    - 82-001957
  - Chemical Reclamation
    - 82-002984
  - Exploitation Rates
    - 82-000221
  - Fish Stocks
    - 82-001248
  - Fisherman Surveys
    - 82-001201
  - Flow Regimes
    - 82-001247

...CONTINUED...

- Management/Research--Rivers and Streams
  - Flow Regimes
    - 82-001257
    - 82-002014
    - 82-002895
    - 82-002902
  - General
    - 82-000487
  - Gravel Cleaning
    - 82-000485
  - Grazing
    - 82-002989
  - Habitat Alterations
    - 82-002907
    - 82-002988
  - Habitat Evaluation
    - 82-002990
  - Habitat Rating Systems
    - 82-002990
  - Missouri River
    - 82-002987
  - Population Studies
    - 82-000221
    - 82-002464
    - 82-002519
    - 82-002992
  - Potomac River
    - 82-001250
    - 82-001251
  - Pre-Impoundment Studies
    - 82-002013
  - Put-and-Take
    - 82-001201
  - Regulations/Catch and Release
    - 82-002925
  - Regulations/Size Limits
    - 82-002927
  - Reservoir Release Effects
    - 82-001246
    - 82-001257
    - 82-002521
    - 82-002902
    - 82-002985
    - 82-002986
  - Restoration of Anadromous Runs
    - 82-000486
    - 82-001244
  - Riparian Habitat
    - 82-001177
    - 82-002557
    - 82-002905
    - 82-002907
    - 82-002989
    - 82-002991
  - Stocking/Introductions
    - 82-001201
  - Stream Improvement/General
    - 82-001958
    - 82-001964

...CONTINUED...

- Management/Research--Rivers and Streams
  - Stream Improvement/General
    - 82-002893
    - 82-002906
  - Tailwaters
    - 82-001257
  - Trout Stream Management
    - 82-001958
    - 82-001964
- Modeling
  - Age/Growth
    - 82-000994
    - 82-001688
    - 82-001998
  - Biomass Dynamics
    - 82-002473
  - Digestion Rates
    - 82-001478
  - Economic Values
    - 82-001180
    - 82-001221
    - 82-001969
  - Exploitation Rates
    - 82-002966
  - Fishing Gear
    - 82-001211
  - Foods/Feeding
    - 82-001225
  - Foods/Feeding/Selectivity
    - 82-000942
  - Forecasting
    - 82-000481
  - General
    - 82-001833
    - 82-002969
  - Heavy Metals
    - 82-001871
  - Impingement/Entrainment
    - 82-001217
    - 82-001218
  - Locomotion
    - 82-000651
  - Management Decisions
    - 82-000481
  - Mercury
    - 82-001871
  - Mortality Rates
    - 82-000994
    - 82-001227
  - Nutrients Budgets
    - 82-002999
  - Optimum Sustainable Yield
    - 82-002002
  - Pollution
    - 82-001869
  - Population Studies
    - 82-001621
    - 82-002003
    - 82-002967
    - 82-002972
    - 82-002974

...CONTINUED...
- Modeling
  - Population Studies
    - 82-002975
    - 82-002976
    - 82-002977
  - Predator/Prey Relationships
    - 82-001223
    - 82-001224
  - Production
    - 82-000479
    - 82-000490
  - Reservoir Release Effects
    - 82-000453
  - Stock-Production
    - 82-002970
    - 82-002971
  - Stock-Recruitment
    - 82-000224
    - 82-000865
    - 82-001222
    - 82-001997
    - 82-001999
    - 82-002001
    - 82-002968
    - 82-002973
  - Stocking/Introductions
    - 82-000468
  - Temperature Selection
    - 82-001561
  - Thermal Pollution
    - 82-000393
  - Yield
    - 82-000482
    - 82-001270
    - 82-002001
- Morphology
  - Abnormalities
    - 82-000589
    - 82-001362
    - 82-001365
    - 82-002073
    - 82-002133
    - 82-002152
    - 82-002178
    - 82-002206
  - Acoustico-Lateralis System
    - 82-000593
    - 82-000610
    - 82-000616
    - 82-001355
    - 82-001377
    - 82-002162
    - 82-002177
  - Alarm Cells
    - 82-000631
  - Albinism
    - 82-002185
  - Auditory Senses
    - 82-000602

...CONTINUED...
- Morphology
  - Auditory Senses
    - 82-000627
    - 82-001553
  - Barbels
    - 82-001358
  - Blood
    - 82-000611
    - 82-000789
    - 82-002163
  - Body Form
    - 82-000044
    - 82-000066
    - 82-000183
  - Cardio-Vascular System
    - 82-000061
    - 82-000611
    - 82-002130
  - Character Displacement
    - 82-002188
  - Coloration
    - 82-000081
    - 82-000604
    - 82-000606
    - 82-001362
    - 82-001367
    - 82-001468
    - 82-001564
    - 82-002136
    - 82-002184
    - 82-002195
    - 82-002399
  - Corpuscle of Stannius
    - 82-000594
  - Dentition
    - 82-000062
    - 82-000590
    - 82-000623
    - 82-000624
    - 82-002198
  - Digestive System
    - 82-000048
    - 82-000071
    - 82-000117
    - 82-000622
    - 82-000758
    - 82-001354
    - 82-002124
    - 82-002144
  - Dwarfism
    - 82-002424
    - 82-002496
  - Early Development
    - 82-000010
    - 82-000052
    - 82-000054
    - 82-000068
    - 82-000072
    - 82-000076
    - 82-000614
    - 82-001361

...CONTINUED...
- Morphology
  - Early Development
    - 82-001370
    - 82-001379
    - 82-002122
    - 82-002124
    - 82-002127
    - 82-002142
    - 82-002165
    - 82-002190
    - 82-002196
    - 82-002203
    - 82-002204
  - Eggs
    - 82-002174
  - Electric Organs
    - 82-000721
  - Embryology
    - 82-000010
    - 82-000052
    - 82-000054
    - 82-000065
    - 82-000077
    - 82-000135
    - 82-000597
    - 82-000613
    - 82-000614
    - 82-001361
    - 82-001370
    - 82-002125
    - 82-002161
    - 82-002168
    - 82-002194
    - 82-002485
  - Endocrinology
    - 82-001445
  - Evolution
    - 82-001360
  - Excretory System
    - 82-000630
    - 82-002180
    - 82-002192
    - 82-002211
    - 82-002212
  - Fin Rays
    - 82-000067
    - 82-001363
  - Fins
    - 82-000607
    - 82-000625
    - 82-001365
    - 82-002132
    - 82-002149
    - 82-002166
    - 82-002182
  - General
    - 82-001360
  - Gills
    - 82-000056

...CONTINUED...
- Morphology
  - Gills
    - 82-000621
  - Head Kidney
    - 82-002192
  - Histology
    - 82-002148
    - 82-002180
  - Integument
    - 82-001571
    - 82-002184
  - Length-Weight Relationships
    - 82-002597
  - Leydig Organ
    - 82-001372
  - Liver
    - 82-000049
    - 82-002146
    - 82-002202
  - Meristic Studies
    - 82-000045
    - 82-000050
    - 82-000057
    - 82-000058
    - 82-000073
    - 82-000079
    - 82-000591
    - 82-000615
    - 82-000772
    - 82-001356
    - 82-001359
    - 82-002123
    - 82-002138
    - 82-002147
    - 82-002160
    - 82-002188
  - Metamorphosis
    - 82-000062
    - 82-002143
  - Mouth Parts
    - 82-000060
    - 82-000062
    - 82-000932
    - 82-001667
    - 82-002187
    - 82-002537
  - Musculature
    - 82-000046
    - 82-000064
    - 82-000080
    - 82-000600
    - 82-000603
    - 82-000609
    - 82-001014
    - 82-001393
    - 82-001488
    - 82-002121
    - 82-002176
    - 82-002329
  - Nervous System
    - 82-000074

...CONTINUED...

- Morphology
  - Nervous System
    - 82-000598
    - 82-001368
    - 82-002149
    - 82-002169
  - Olfaction
    - 82-000047
  - Otoliths
    - 82-000602
    - 82-000629
    - 82-001371
    - 82-001684
    - 82-001699
    - 82-002208
    - 82-002595
    - 82-002610
  - Pancreas
    - 82-002193
  - Pharyngeal Teeth
    - 82-002156
    - 82-002198
  - Pigments
    - 82-002170
    - 82-002195
  - Pineal Body
    - 82-000628
    - 82-002135
  - Pituitary
    - 82-002128
    - 82-002167
  - Pugheadedness
    - 82-000589
    - 82-000592
  - Rectal Gland
    - 82-000069
  - Reproductive System
    - 82-000051
    - 82-000059
    - 82-000063
    - 82-000605
    - 82-000619
    - 82-001357
    - 82-001376
    - 82-001378
    - 82-001405
    - 82-002134
    - 82-002155
    - 82-002179
    - 82-002181
    - 82-002199
    - 82-002210
  - Respiratory System
    - 82-000056
    - 82-001379
    - 82-002194
  - Rostral Organ
    - 82-001353
  - Scales
    - 82-000288

...CONTINUED...

- Morphology
  - Scales
    - 82-000298
    - 82-000617
    - 82-000626
    - 82-000632
    - 82-000633
    - 82-002126
    - 82-002129
    - 82-002131
    - 82-002171
    - 82-002172
    - 82-002205
  - Seismosensory System
    - 82-000075
    - 82-002150
  - Sexual Dimorphism
    - 82-000079
    - 82-000608
    - 82-001677
    - 82-002182
    - 82-002213
  - Skeletal System
    - 82-000078
    - 82-000104
    - 82-000351
    - 82-000603
    - 82-000625
    - 82-001031
    - 82-001375
    - 82-001380
    - 82-001381
    - 82-001382
    - 82-002133
    - 82-002141
    - 82-002164
    - 82-002166
    - 82-002171
    - 82-002175
    - 82-002178
    - 82-002191
    - 82-002207
    - 82-002209
  - Smooth Endoplasmic Reticulum Cell
    - 82-002265
  - Steroids
    - 82-000619
  - Subcommissural Organ
    - 82-002159
  - Swimbladder
    - 82-000595
    - 82-000610
    - 82-002183
  - Taste Reception
    - 82-000601
  - Techniques/Skeletal System
    - 82-000053
  - Techniques/Surface Area
    - 82-000070
  - Teratology
    - 82-000592

...CONTINUED...
- Morphology
  - Thymus
    - 82-002201
  - Tuberculation
    - 82-000618
  - Unculi
    - 82-002189
  - Variation Studies
    - 82-000050
    - 82-000345
    - 82-000591
    - 82-000612
    - 82-001010
    - 82-001369
    - 82-001373
    - 82-001374
    - 82-001537
    - 82-002123
    - 82-002139
    - 82-002141
    - 82-002147
    - 82-002188
    - 82-002380
    - 82-002381
  - Vision
    - 82-000055
    - 82-000596
    - 82-000599
    - 82-000620
    - 82-000699
    - 82-000810
    - 82-001364
    - 82-001366
    - 82-001467
    - 82-002137
    - 82-002143
    - 82-002145
    - 82-002151
    - 82-002153
    - 82-002154
    - 82-002157
    - 82-002158
    - 82-002173
    - 82-002186
    - 82-002197
- Natural History
  - Abundance/Factors of
    - 82-000984
    - 82-000992
    - 82-000994
    - 82-002028
    - 82-002639
    - 82-002660
    - 82-002979
  - Abundance/Seasonal
    - 82-002515
  - Activity Patterns
    - 82-000892
  - Age/Growth
    - 82-002589

...CONTINUED...
- Natural History
  - Age/Growth
    - 82-002608
  - Allochthonous Food
    - 82-002557
  - Bioenergetics
    - 82-002455
  - Biogeography
    - 82-000961
    - 82-000970
  - Biomass
    - 82-000861
  - Distribution/Factors of
    - 82-000319
    - 82-000892
    - 82-000969
    - 82-000976
    - 82-002646
  - Distribution/Geographical
    - 82-000314
  - Distribution/Seasonal
    - 82-002519
  - Distribution/Vertical
    - 82-000276
    - 82-000894
  - Egg Survival
    - 82-002659
  - Evolution
    - 82-000853
    - 82-000857
  - Fish Stocks
    - 82-000615
    - 82-000763
    - 82-000776
    - 82-000783
    - 82-000843
    - 82-000857
    - 82-000863
    - 82-001232
  - Foods/Feeding
    - 82-000275
    - 82-000276
    - 82-000902
    - 82-001642
    - 82-001661
    - 82-001956
    - 82-002546
    - 82-002558
    - 82-002569
    - 82-002608
    - 82-002992
  - Foods/Feeding/Selectivity
    - 82-002550
  - General
    - 82-001163
  - General/Larval Fish
    - 82-000217
  - Mortality Rates
    - 82-001745
    - 82-002008
    - 82-002873

## SUBJECT INDEX

...CONTINUED...
Natural History
  Movements
    82-002521
  Musculature
    82-000609
  Paleontology
    82-000624
    82-001770
    82-002637
  Population Genetics
    82-000763
  Population Studies
    82-000227
    82-000779
    82-000863
    82-002596
  Predator/Prey Relationships
    82-000274
    82-000279
    82-000282
    82-000328
    82-000463
    82-000466
    82-000467
    82-000469
    82-000904
    82-000913
    82-000929
    82-000990
    82-000992
    82-000995
    82-001647
    82-001649
    82-001654
    82-001659
    82-001663
    82-001679
    82-002028
    82-002531
    82-002541
    82-002552
    82-002558
    82-002564
    82-002573
  Production
    82-001614
    82-002455
  Spawning
    82-000653
  Standing Crop
    82-000861
  Taxonomy
    82-000609
    82-000609
    82-001163
    82-001774
    82-002688
  Trophic Relationships
    82-000913

...CONTINUED...
Natural History
  Trophic Relationships
    82-001249
    82-001665
    82-002392
    82-002979
Oceanography
  Benthos
    82-000929
  Currents
    82-001344
  General
    82-001264
  Phytoplankton
    82-000588
  Primary Production
    82-000588
  Secondary Production
    82-001614
  Zooplankton
    82-000585
Parasites/Diseases
  Acanthamoeba
    82-001812
  Acanthobothrium
    82-002762
  Acanthocephala
    82-000388
    82-001862
    82-002771
    82-002777
    82-002782
  Acanthocephalus clavula
    82-002771
  Acanthocephalus lucidus
    82-000388
  Actinocleidus oculatus
    82-000381
  Actinocleidus recurvatus
    82-000381
  Aeromonas hydrophila
    82-001045
    82-001047
    82-001804
  Aeromonas salmonicida
    82-000365
    82-001041
    82-001042
    82-001789
    82-001791
    82-001795
    82-001797
    82-002728
    82-002733
    82-002735
  Aethycteron
    82-001858
  Alloglossidium corti
    82-001068
  Ambiphrya ameiuri
    82-001811

## SUBJECT INDEX

...CONTINUED...
Parasites/Diseases
Anasakis
82-002766
Anemia
82-000754
Anilocra
82-000391
Anilocra chromis
82-002785
Anisakis
82-001063
82-001860
Apatemon gracilis
82-001070
Ascarophis
82-000380
Asymphylodora tincae
82-001089
Atractidae
82-002754
Bacterial Diseases
82-000364
82-000365
82-000366
82-000367
82-000368
82-000369
82-000370
82-000371
82-000372
82-001039
82-001040
82-001041
82-001042
82-001043
82-001044
82-001045
82-001046
82-001047
82-001789
82-001790
82-001791
82-001792
82-001793
82-001794
82-001795
82-001796
82-001797
82-001798
82-001799
82-001800
82-001801
82-001802
82-001803
82-001804
82-001805
82-001904
82-002721
82-002726
...CONTINUED...
Parasites/Diseases
Bacterial Diseases
82-002727
82-002728
82-002729
82-002730
82-002731
82-002732
82-002733
82-002734
82-002735
Bacterial Kidney Disease
82-000368
82-001790
Bibliographies
82-001782
Biological Tags
82-000460
Black Patch Necrosis
82-001080
Black-Spot Disease
82-001071
82-001076
Blindness
82-001084
Bothriocephalus acheilognathi
82-002767
Bothriocephalus scorpii
82-002773
Botulism
82-001043
82-002727
Bucephalus gorgon
82-001846
Cauliflower Disease
82-001035
Ceratothoa imbricatus
82-001078
Cestodes
82-001065
82-001067
82-001073
82-001829
82-001844
82-001856
82-002760
82-002761
82-002762
82-002767
82-002773
82-002776
82-002780
Chlamydia
82-002786
Chloromyxum truttae
82-001806
Clostridium botulinum
82-001043
82-002727
Cnidospora
82-000373

...CONTINUED...
Parasites/Diseases
  Contracaecum
    82-002766
  Corneal Injuries
    82-000389
  Cosmoceridae
    82-002754
  Crepidostomum
    82-002750
  Cyathocephalus truncatus
    82-001856
  Cyptocaryon irritans
    82-001809
  Cytophaga
    82-002731
  Deretrema philippinensis
    82-002755
  Dermocystidium
    82-001821
  Dermophthirius
    82-001064
  Diclidophora nezumiae
    82-000387
  Diplostomum phoxini
    82-001061
  Diplostomum spathaceum
    82-001083
    82-001850
    82-002757
  Edwardsiella ictaluri
    82-001802
  Edwardsiella tarda
    82-000366
    82-002729
  Egtved Virus
    82-001060
    82-001839
  Eimeria
    82-001815
    82-001817
  Eimeria funduli
    82-001055
    82-001819
    82-002742
  Enteric Redmouth Disease
    82-001796
    82-001803
  Epieimeria
    82-001815
  Epistylis
    82-000374
    82-000377
  Ergasilus
    82-001851
    82-001859
  Ergenstrema labrosi
    82-000378
  Eustrongylides tubifex
    82-002759

...CONTINUED...
Parasites/Diseases
  Exophthalmos
    82-000384
  Fin Rot
    82-000367
  Flexibacter columnaris
    82-000371
  Forticulcita glabra
    82-002779
  Fungal Diseases
    82-001048
    82-002736
  Furunculosis
    82-001041
    82-001795
    82-002733
  Gas Bubble Disease
    82-000672
    82-001075
    82-001335
  General
    82-000362
    82-000902
    82-001032
    82-001033
    82-001034
    82-001038
    82-001085
    82-001777
    82-001778
    82-001779
    82-001781
    82-001783
    82-001785
    82-001786
    82-001787
    82-001788
    82-002715
    82-002717
    82-002718
    82-002719
    82-002720
    82-002722
    82-002723
    82-002724
    82-002725
  General/Arizona
    82-001784
  General/Malaysia
    82-000363
  General/New Mexico
    82-001784
  General/Treatment
    82-001782
  Gill Parasites
    82-000378
    82-000382
    82-001811
    82-001851

...CONTINUED...

- Parasites/Diseases
  - Gill Parasites
    - 82-001859
  - Glugea
    - 82-001050
  - Glugea stephani
    - 82-000376
    - 82-001056
  - Golden Shiner Virus
    - 82-002747
    - 82-002748
  - Goussia
    - 82-001815
  - Gyrodactylus
    - 82-002769
  - Gyrodactylus bullatarudis
    - 82-002781
  - Gyrodactylus pleuronecti
    - 82-001066
  - Haemogregarina bigemina
    - 82-002738
  - Halvorsenius exilis
    - 82-000385
  - Haplorchis pumilio
    - 82-001835
    - 82-001836
  - Helminths
    - 82-001852
  - Hematozoa
    - 82-001052
    - 82-002738
  - Henneguya shaharini
    - 82-001054
  - Hysterothylacium
    - 82-002764
  - Ichthyophthiriasis
    - 82-001904
  - Ichthyophthirius multifiliis
    - 82-001904
  - IHN
    - 82-001818
    - 82-001826
    - 82-002744
  - IHP
    - 82-001059
  - Immune Response
    - 82-001036
    - 82-001037
    - 82-001040
    - 82-001053
    - 82-001799
    - 82-001802
    - 82-002716
    - 82-002728
    - 82-002734
    - 82-002735
  - Immunization
    - 82-001040
    - 82-001042

...CONTINUED...

- Parasites/Diseases
  - Immunization
    - 82-001047
    - 82-001792
    - 82-001793
    - 82-001794
    - 82-001800
    - 82-001831
    - 82-001837
    - 82-002732
  - IPN
    - 82-001057
    - 82-001113
    - 82-001818
    - 82-001822
    - 82-001824
    - 82-001825
    - 82-001827
    - 82-001830
    - 82-001838
    - 82-002749
  - Kudoa
    - 82-000375
  - Kuhnia scombri
    - 82-001069
  - Lebertia
    - 82-002763
  - Leeches
    - 82-002784
  - Leptorhynchoides thecatus
    - 82-002782
  - Lernaea cruciata
    - 82-001077
  - Lernaeenicus radiatus
    - 82-002770
  - Ligula intestinalis
    - 82-001073
  - Lissorchis
    - 82-001843
  - Lissorchis attenuatus
    - 82-001847
  - Lymphocystis
    - 82-001805
    - 82-002746
  - Macruricotyle newfoundlandiae
    - 82-002760
  - Mebendazole
    - 82-001849
  - Mites
    - 82-002763
  - Mixodigmatidae
    - 82-001844
  - Muscular Dystrophy
    - 82-000561
  - Myxidium
    - 82-001814
    - 82-002737
  - Myxobilatus mictospora
    - 82-001049
  - Myxobolus
    - 82-001053

## SUBJECT INDEX

...CONTINUED...
Parasites/Diseases
Myxobolus osburni
82-001051
Myxobolus tauricus
82-001807
Myxosoma cerebralis
82-001820
Naegleria
82-001812
Nematodes
82-000380
82-001063
82-001074
82-001082
82-001841
82-002754
82-002759
82-002764
82-002766
82-002768
82-002778
Neoechinorhynchus limi
82-002777
Nephrocalcinosus
82-001072
Nerocila phaeopleura
82-001855
Nerocilia californica
82-001062
Nutritional Diseases
82-001072
Ophiotaenia critica
82-002776
Ophioxenos lampetrae
82-002756
Ornithodiplostomum ptychocheilus
82-002752
Parabothriocephalus macruri
82-002760
Paracreptotrematina limi
82-002751
Paradilepis simoni
82-001065
Paraheteronchocotyle amazonensis
82-000386
Parasitic Copepods
82-000390
82-001077
82-001851
82-001855
82-001859
82-002770
82-002772
Parasitic Isopods
82-000391
82-001062
82-001078
82-002785
Pennella diodontis
82-002772

...CONTINUED...
Parasites/Diseases
Philometra ovata
82-001841
Pingus sinensis
82-002768
Piscine Erythrocytic Necrosis
82-001832
Pistana eurypharyngis
82-002761
Posthodiplostomum minimum
82-002752
Posthodiplostomum minimum minimum
82-001081
Potamotrygonocotyle tsalickisi
82-000386
Proliferative Kidney Disease
82-001086
82-001810
82-001813
Proteocephalus
82-002780
Proteocephalus percae
82-001829
Protomicrocotyle nayaritensis
82-002758
Protozoan Diseases
82-000373
82-000374
82-000375
82-000376
82-000377
82-001049
82-001050
82-001051
82-001052
82-001053
82-001054
82-001055
82-001056
82-001806
82-001807
82-001808
82-001809
82-001810
82-001811
82-001812
82-001813
82-001814
82-001815
82-001816
82-001817
82-001819
82-001820
82-001821
82-002467
82-002737
82-002738
82-002739
82-002740

...CONTINUED...
- Parasites/Diseases
  - Protozoan Diseases
    - 82-002741
    - 82-002742
  - Pseudomonas anguilliseptica
    - 82-001799
  - Rhabdovirus Disease
    - 82-001828
  - Rhabdoviurus salmonis
    - 82-002745
  - Rickettsia
    - 82-002786
  - Salmincola californiensis
    - 82-000390
  - Saprolegnia
    - 82-002736
  - Schistocephalus solidus
    - 82-001856
  - Sekoke Disease
    - 82-000561
  - Skin Lesions
    - 82-001088
  - Sphaerostoma bramae
    - 82-001854
  - Spinitectus carolini
    - 82-001074
  - Spring Ulcer Disease
    - 82-001845
  - Streptococcus
    - 82-000369
    - 82-000372
    - 82-001046
  - Styphlotrema artigasi
    - 82-001853
  - Telogaster opisthorchis
    - 82-001079
  - Tetraonchus
    - 82-002753
  - Trematodes
    - 82-000378
    - 82-000379
    - 82-000381
    - 82-000382
    - 82-000383
    - 82-000385
    - 82-000386
    - 82-000387
    - 82-001061
    - 82-001064
    - 82-001066
    - 82-001068
    - 82-001069
    - 82-001070
    - 82-001071
    - 82-001076
    - 82-001079
    - 82-001081
    - 82-001083
    - 82-001089

...CONTINUED...
- Parasites/Diseases
  - Trematodes
    - 82-001835
    - 82-001836
    - 82-001840
    - 82-001842
    - 82-001843
    - 82-001846
    - 82-001847
    - 82-001848
    - 82-001849
    - 82-001850
    - 82-001853
    - 82-001854
    - 82-001857
    - 82-001858
    - 82-001860
    - 82-002750
    - 82-002751
    - 82-002752
    - 82-002753
    - 82-002755
    - 82-002756
    - 82-002757
    - 82-002758
    - 82-002760
    - 82-002769
    - 82-002774
    - 82-002779
    - 82-002781
    - 82-002783
  - Triaenophorus crassus
    - 82-001067
  - Trichlorfon
    - 82 001849
  - Trichodina
    - 82-001808
    - 82-002739
  - Tumors
    - 82-001087
  - Tylodelphys clavata
    - 82-001083
  - Ulcerative Dermal Necrosis
    - 82-001780
  - Ulcers
    - 82-001845
    - 82-002721
  - Unicapsula seriolae
    - 82-002741
  - Urocleidus adspectus
    - 82-000382
    - 82-000383
  - Uvulifer amblоplitis
    - 82-001076
  - Vibrio anguillarum
    - 82-000369
    - 82-001792
    - 82-001793
    - 82-001794
    - 82-001795
    - 82-001797

...CONTINUED...
- Parasites/Diseases
  - Vibrio anguillarum
    - 82-002721
  - Vibriosis
    - 82-000364
    - 82-001044
    - 82-001046
    - 82-001792
    - 82-001795
    - 82-001801
    - 82-002726
  - Viral Diseases
    - 82-001057
    - 82-001058
    - 82-001059
    - 82-001060
    - 82-001113
    - 82-001818
    - 82-001822
    - 82-001823
    - 82-001824
    - 82-001825
    - 82-001826
    - 82-001827
    - 82-001828
    - 82-001830
    - 82-001831
    - 82-001832
    - 82-001834
    - 82-001837
    - 82-001838
    - 82-001839
    - 82-002721
    - 82-002743
    - 82-002744
    - 82-002745
    - 82-002746
    - 82-002747
    - 82-002748
    - 82-002749
  - Viral Hemorrhagic Septicemia
    - 82-001058
    - 82-001828
    - 82-001834
    - 82-001837
    - 82-002743
  - Visceral Granuloma
    - 82-001072
  - Whirling Disease
    - 82-001820
  - X-cells
    - 82-002765
    - 82-002775
  - Yersinia ruckeri
    - 82-001793
    - 82-001794
    - 82-001796
    - 82-001800
    - 82-001803

...CONTINUED...
- Parasites/Diseases
  - Yersinia ruckeri
    - 82-002734
  - Zschokkella
    - 82-002740
- Physiology
  - Acoustico-Lateralis System
    - 82-000642
    - 82-000797
  - Adrenalin
    - 82-001476
  - Air Breathing
    - 82-000100
    - 82-000116
    - 82-000136
    - 82-000671
    - 82-000697
    - 82-000733
    - 82-001379
    - 82-001447
    - 82-001489
    - 82-002194
    - 82-002230
    - 82-002276
  - Alcohol Dehydrogenase
    - 82-000101
  - Amino Acids
    - 82-000037
    - 82-000083
    - 82-000130
    - 82-000156
    - 82-000157
    - 82-001487
    - 82-002087
    - 82-002097
    - 82-002245
    - 82-002371
  - Anoxia
    - 82-000147
    - 82-001513
    - 82-002267
    - 82-002359
  - Antifreeze Production
    - 82-000106
    - 82-000667
    - 82-000717
    - 82-001470
    - 82-002261
    - 82-002262
    - 82-002333
  - Antigens
    - 82-000144
  - Ascorbic Acid
    - 82-000145
    - 82-001492
    - 82-001933
    - 82-002097
  - ATP
    - 82-000635
    - 82-000662
    - 82-000687

...CONTINUED...
- Physiology
  - ATP
    - 82-001421
    - 82-001516
    - 82-001520
    - 82-002326
  - Auditory Senses
    - 82-000666
  - Biochemical Composition
    - 82-000087
    - 82-000638
    - 82-000655
    - 82-001399
    - 82-001404
    - 82-001405
    - 82-001499
    - 82-001510
    - 82-002219
    - 82-002246
    - 82-002268
    - 82-002271
    - 82-002287
    - 82-002309
    - 82-002344
    - 82-002360
    - 82-002796
  - Bioenergetics
    - 82-000124
    - 82-000673
    - 82-000694
    - 82-001441
    - 82-002216
    - 82-002295
    - 82-002316
    - 82-002351
  - Blood Chemistry
    - 82-000085
    - 82-000098
    - 82-000100
    - 82-000112
    - 82-000114
    - 82-000120
    - 82-000123
    - 82-000148
    - 82-000644
    - 82-000680
    - 82-000687
    - 82-000691
    - 82-000693
    - 82-000712
    - 82-000713
    - 82-000718
    - 82-000736
    - 82-000741
    - 82-000744
    - 82-000754
    - 82-001109
    - 82-001388
    - 82-001389

...CONTINUED...
- Physiology
  - Blood Chemistry
    - 82-001400
    - 82-001401
    - 82-001411
    - 82-001422
    - 82-001429
    - 82-001430
    - 82-001448
    - 82-001449
    - 82-001454
    - 82-001455
    - 82-001456
    - 82-001462
    - 82-001464
    - 82-001493
    - 82-001501
    - 82-001511
    - 82-002222
    - 82-002224
    - 82-002228
    - 82-002229
    - 82-002231
    - 82-002232
    - 82-002245
    - 82-002251
    - 82-002252
    - 82-002260
    - 82-002281
    - 82-002282
    - 82-002283
    - 82-002299
    - 82-002306
    - 82-002315
    - 82-002326
    - 82-002335
    - 82-002337
    - 82-002338
    - 82-002342
    - 82-002343
    - 82-002353
    - 82-002354
    - 82-002357
    - 82-002363
    - 82-002365
    - 82-002366
    - 82-002766
    - 82-002848
  - Cadmium
    - 82-000430
  - Calcium
    - 82-000742
    - 82-001895
    - 82-001896
    - 82-002368
  - Carbon
    - 82-002272
  - Cardio-Vascular System
    - 82-000656
    - 82-000657
    - 82-000718

## SUBJECT INDEX

...CONTINUED...
Physiology
- Cardio-Vascular System
  - 82-001397
  - 82-001484
  - 82-001512
  - 82-002248
  - 82-002254
  - 82-002267
  - 82-002288
  - 82-002291
  - 82-002313
- Carotenoids
  - 82-000035
  - 82-000128
  - 82-001396
  - 82-002314
- Catecholamines
  - 82-000656
  - 82-000720
  - 82-002366
- Caudal Neurosecretory System
  - 82-001390
  - 82-001457
- Collagen
  - 82-002294
- Copper
  - 82-002356
- Corpuscle of Stannius
  - 82-001471
- Corticosteroids
  - 82-000736
- Cortisol
  - 82-001493
  - 82-002300
  - 82-002353
- Digestion Rates
  - 82-000645
  - 82-000664
  - 82-000685
  - 82-000688
  - 82-001453
  - 82-001478
  - 82-001648
- Digestive System
  - 82-000117
  - 82-000129
  - 82-000151
  - 82-000645
  - 82-000670
  - 82-000686
  - 82-000703
  - 82-000714
  - 82-000732
  - 82-000749
  - 82-000756
  - 82-000759
  - 82-001424
  - 82-001426
  - 82-001451

...CONTINUED...
Physiology
- Digestive System
  - 82-001466
  - 82-001482
  - 82-002250
  - 82-002369
- Digestive System/Bacterial Flora
  - 82-000118
  - 82-001472
  - 82-002349
  - 82-002350
- Early Development
  - 82-000679
  - 82-002509
- Eggs
  - 82-000157
- Electric Organs
  - 82-000149
  - 82-000663
  - 82-000721
  - 82-000750
- Electrophoresis
  - 82-000765
  - 82-001373
  - 82-002260
  - 82-002264
  - 82-002275
  - 82-002299
  - 82-002331
- Electrophysiology
  - 82-001436
  - 82-002221
  - 82-002312
- Electroreception
  - 82-000746
  - 82-001353
  - 82-001415
- Electroshock
  - 82-002221
  - 82-002312
- Embryology
  - 82-000676
  - 82-001409
  - 82-001465
  - 82-002196
  - 82-002659
- Endocrinology
  - 82-000005
  - 82-000512
  - 82-000636
  - 82-000641
  - 82-000643
  - 82-000646
  - 82-000653
  - 82-000658
  - 82-000661
  - 82-000668
  - 82-000669
  - 82-000684
  - 82-000689
  - 82-000690

...CONTINUED...
Physiology
  Endocrinology
    82-000693
    82-000695
    82-000701
    82-000702
    82-000708
    82-000719
    82-000740
    82-000745
    82-000806
    82-000888
    82-001391
    82-001398
    82-001402
    82-001411
    82-001412
    82-001413
    82-001417
    82-001418
    82-001437
    82-001438
    82-001445
    82-001446
    82-001457
    82-001458
    82-001468
    82-001494
    82-001502
    82-001505
    82-001521
    82-001522
    82-002167
    82-002210
    82-002214
    82-002215
    82-002217
    82-002227
    82-002236
    82-002240
    82-002244
    82-002253
    82-002257
    82-002258
    82-002270
    82-002284
    82-002286
    82-002289
    82-002293
    82-002297
    82-002300
    82-002301
    82-002307
    82-002311
    82-002323
    82-002325
    82-002335
    82-002341
    82-002348

...CONTINUED...
Physiology
  Endocrinology
    82-002352
    82-002358
    82-002364
    82-002367
    82-002372
    82-002479
  Enzymes
    82-000117
    82-000129
    82-000131
    82-000132
    82-000142
    82-000152
    82-000654
    82-000675
    82-000703
    82-000706
    82-000724
    82-000741
    82-000757
    82-001373
    82-001383
    82-001406
    82-001409
    82-001414
    82-001419
    82-001420
    82-001423
    82-001428
    82-001432
    82-001444
    82-001473
    82-001496
    82-001497
    82-001500
    82-001513
    82-001514
    82-002218
    82-002234
    82-002249
    82-002250
    82-002264
    82-002268
    82-002274
    82-002321
    82-002344
    82-002347
    82-002371
  Excretory System
    82-000664
    82-000729
    82-001483
    82-002233
    82-002279
    82-002290
    82-002308
    82-002327
  Exercise
    82-001400

...CONTINUED...
Physiology
  Exercise
   82-001435
   82-001484
   82-002224
   82-002231
   82-002324
   82-002342
  Fertilization
   82-000639
  Food Conversion Efficiency
   82-001519
   82-001671
  General
   82-001163
   82-002242
  Glucose
   82-000660
   82-002318
  Healing
   82-000681
  Heavy Metals
   82-001871
  Hermaphroditism
   82-000092
   82-000723
   82-000725
   82-000734
   82-002278
   82-002336
   82-002370
  Hormones
   82-000103
   82-000119
   82-000153
   82-000526
   82-000531
   82-000643
   82-000646
   82-000665
   82-000686
   82-000689
   82-000710
   82-000713
   82-000740
   82-000756
   82-001391
   82-001412
   82-001414
   82-001417
   82-001426
   82-001446
   82-001475
   82-001486
   82-001495
   82-001502
   82-001505
   82-001512
   82-002214

...CONTINUED...
Physiology
  Hormones
   82-002227
   82-002236
   82-002240
   82-002267
   82-002280
   82-002289
   82-002307
   82-002311
   82-002319
   82-002323
   82-002325
   82-002364
   82-002365
   82-002372
  Hypothalamic-Hypophyseal System
   82-001450
  Hypoxia
   82-000089
   82-000116
   82-000698
   82-000735
   82-000739
   82-000744
   82-001394
   82-001479
   82-001516
  Immune Response
   82-000115
   82-000724
   82-000726
   82-001036
   82-001037
   82-001491
   82-001498
   82-002339
   82-002340
  Inbreeding
   82-002206
  Induced Maturation
   82-000111
   82-000526
   82-001504
  Iodine
   82-002078
  Lipid Composition
   82-000139
   82-000157
   82-001392
   82-002247
   82-002328
  Lipid Content
   82-000119
   82-000139
   82-002360
  Lipid Metabolism
   82-000090
   82-000105
   82-000562
   82-000563

...CONTINUED...
- Physiology
  - Lipid Metabolism
    - 82-000737
    - 82-002247
  - Liver
    - 82-000152
    - 82-000728
  - Locomotion
    - 82-001517
  - Lordosis
    - 82-000696
  - Magnesium
    - 82-000133
  - Malate Dehydrogenase
    - 82-001496
    - 82-001497
  - Maturation
    - 82-000146
    - 82-000166
    - 82-000245
    - 82-000755
    - 82-001384
    - 82-002220
    - 82-002263
    - 82-002329
    - 82-002330
    - 82-002348
    - 82-002367
    - 82-002499
    - 82-002510
  - Melanophores
    - 82-002280
  - Mercury
    - 82-001871
  - Metabolic Rates
    - 82-000113
    - 82-000140
    - 82-000659
    - 82-000673
    - 82-000709
    - 82-000747
    - 82-001434
    - 82-001506
    - 82-001551
    - 82-002216
    - 82-002243
    - 82-002255
    - 82-002272
    - 82-002290
    - 82-002298
    - 82-002361
  - Metabolism
    - 82-000130
    - 82-000141
    - 82-000155
  - Metallothionein
    - 82-001509
    - 82-001510
  - Metamorphosis
    - 82-000087

...CONTINUED...
- Physiology
  - Metamorphosis
    - 82-000091
    - 82-000648
    - 82-000758
    - 82-001481
    - 82-002223
  - Mitogens
    - 82-000726
  - Mucus
    - 82-002226
  - Musculature
    - 82-001393
    - 82-001487
    - 82-001488
    - 82-001520
    - 82-002269
    - 82-002329
  - Nervous System
    - 82-000093
    - 82-000122
    - 82-000192
    - 82-000651
    - 82-001418
    - 82-001517
    - 82-001557
    - 82-002256
    - 82-002322
  - Nitrogen
    - 82-000155
  - Nitrogen Metabolism
    - 82-000645
    - 82-001514
    - 82-001515
    - 82-002079
  - Nutrition
    - 82-000030
    - 82-000034
    - 82-000035
    - 82-000552
    - 82-001315
    - 82-002083
    - 82-002086
    - 82-002087
    - 82-002096
    - 82-002097
    - 82-002343
  - Olfaction
    - 82-000093
    - 82-002345
  - Osmoregulation
    - 82-000094
    - 82-000097
    - 82-000125
    - 82-000126
    - 82-000133
    - 82-000137
    - 82-000634
    - 82-000636
    - 82-000650
    - 82-000661

...CONTINUED...
Physiology
  Osmoregulation
    82-000662
    82-000668
    82-000674
    82-000678
    82-000687
    82-000705
    82-000715
    82-000717
    82-000720
    82-000753
    82-001395
    82-001406
    82-001407
    82-001412
    82-001427
    82-001431
    82-001443
    82-001448
    82-001457
    82-001458
    82-001485
    82-001748
    82-002211
    82-002212
    82-002237
    82-002239
    82-002259
    82-002273
    82-002291
    82-002297
    82-002317
    82-002362
  Pancreas
    82-000757
  Parr-Smolt Transformation
    82-000110
    82-001385
    82-002239
  pH
    82-002326
  pH Regulation
    82-001407
  Pheromones
    82-000796
    82-001463
  Phosphorus
    82-002368
  Pineal Body
    82-000704
    82-001439
    82-001507
    82-001508
    82-001568
  Protein Metabolism
    82-000748
  Protein Synthesis
    82-000109

...CONTINUED...
Physiology
  Protein Synthesis
    82-000677
    82-002303
  Rectal Gland
    82-002291
  Regeneration
    82-001456
    82-002266
    82-002322
  Reproduction
    82-000086
    82-000088
    82-000111
    82-000123
    82-000138
    82-000145
    82-000153
    82-000154
    82-000640
    82-000641
    82-000643
    82-000653
    82-000658
    82-000669
    82-000708
    82-000719
    82-000730
    82-000738
    82-000740
    82-000743
    82-000888
    82-001386
    82-001387
    82-001437
    82-001444
    82-001445
    82-001473
    82-001474
    82-001477
    82-001494
    82-001495
    82-001505
    82-001521
    82-001632
    82-002218
    82-002246
    82-002270
    82-002299
    82-002301
    82-002334
    82-002348
    82-002352
    82-002367
    82-002479
    82-002504
    82-002506
    82-002512
  Reproductive System
    82-000707
    82-000714

...CONTINUED...
Physiology
  Reproductive System
    82-002292
    82-002305
  Respiration
    82-000089
    82-000644
    82-000697
    82-000698
    82-000733
    82-001332
    82-001394
    82-001425
    82-001447
    82-001469
    82-001479
    82-001489
    82-001501
    82-001505
    82-002230
    82-002288
    82-002296
    82-002298
  RNA
    82-001490
  Rubidium
    82-000125
  Saccus Vasculosus
    82-001410
    82-001433
  Scales
    82-002235
    82-002287
  Selenium
    82-000683
  Sex Determination
    82-000710
  Sex Reversal
    82-000711
    82-002336
  Skeletal System
    82-001103
    82-002364
    82-002796
  Sperm
    82-000121
    82-002225
  Starvation
    82-000131
    82-000654
    82-000682
    82-000716
    82-001311
    82-002257
    82-002302
  Steroids
    82-000154
    82-000526
    82-000658

...CONTINUED...
Physiology
  Steroids
    82-000708
    82-000719
    82-000730
    82-000745
    82-002240
    82-002304
    82-002332
    82-002341
  Stress
    82-000565
    82-000722
    82-001389
    82-001449
    82-001511
    82-002320
    82-002353
  Swimbladder
    82-000132
    82-000696
    82-000751
    82-000752
    82-001408
    82-001416
    82-002241
  Swimming Performance
    82-000709
    82-001400
    82-001435
  Taurine
    82-000729
  Techniques/Activable Tracers
    82-000127
  Techniques/ATP
    82-000750
  Techniques/Biochemical Composition
    82-001452
  Techniques/Blood Chemistry
    82-000692
    82-000727
    82-002355
  Techniques/Embryology
    82-001442
  Techniques/Hormones
    82-002355
  Techniques/Metabolic Rates
    82-001518
  Techniques/Nervous System
    82-001480
  Techniques/Respirometer
    82-000108
    82-001518
  Temperature
    82-000192
  Thermal Shock
    82-000107
    82-000649
  Thiourea
    82-000095
  Toxins
    82-001459

...CONTINUED...
- Physiology
  - Toxins
    - 82-002310
  - Tubulin
    - 82-000122
  - Vision
    - 82-000143
    - 82-001467
    - 82-002271
    - 82-002330
    - 82-002391
  - Vitamins
    - 82-000030
    - 82-000104
    - 82-000742
    - 82-001315
    - 82-001322
    - 82-002096
    - 82-002277
    - 82-002729
  - Vitellogenin
    - 82-000643
    - 82-000740
    - 82-000743
    - 82-002352
- Pollution
  - Acid Mine Water
    - 82-001096
    - 82-001099
    - 82-001100
    - 82-001104
    - 82-002794
    - 82-002811
  - Acid Precipitation
    - 82-000394
    - 82-000398
    - 82-000413
    - 82-001101
    - 82-001878
    - 82-002796
  - Agricultural Processing Effluents
    - 82-001863
  - Arsenic
    - 82-002798
  - Biological Indicators
    - 82-000401
    - 82-000403
    - 82-001111
    - 82-001112
    - 82-002788
  - Biomagnification
    - 82-001146
    - 82-001869
    - 82-001875
    - 82-001876
    - 82-001883
    - 82-001937
    - 82-002803
    - 82-002804

...CONTINUED...
- Pollution
  - Biomagnification
    - 82-002805
    - 82-002812
    - 82-002816
  - Cadmium
    - 82-001098
    - 82-001938
    - 82-002787
    - 82-002798
  - Chlordane
    - 82-002804
  - Chlorinated Hydrocarbons
    - 82-000395
  - Chlorinated Styrenes
    - 82-000406
  - Chlorine
    - 82-001091
    - 82-001880
  - Copper
    - 82-001868
    - 82-001937
  - Cryolite Recovery Sludge
    - 82-002800
  - DDT
    - 82-002804
  - Dredge Spoils
    - 82-002899
    - 82-002900
  - Economic Values
    - 82-001887
  - Endosulfan
    - 82-001102
  - Eutrophication
    - 82-001090
  - Feed Lot Runoff
    - 82-000400
  - Fenitrothion
    - 82-000419
  - Fish Hatchery Effluents
    - 82-001106
    - 82-001110
    - 82-001864
    - 82-002058
  - Fluridone
    - 82-002806
  - General
    - 82-001097
    - 82-001103
    - 82-001778
    - 82-001872
    - 82-001884
    - 82-002795
    - 82-002810
  - General/India: Lake Nainital
    - 82-002793
  - Heavy Metals
    - 82-000392
    - 82-000409
    - 82-000410
    - 82-000412

## SUBJECT INDEX

...CONTINUED...
Pollution
  Heavy Metals
    82-000416
    82-000417
    82-000418
    82-001095
    82-001098
    82-001868
    82-001881
    82-001937
    82-001938
    82-002787
    82-002788
    82-002791
    82-002798
    82-002801
    82-002803
    82-002805
    82-002808
    82-002812
    82-002813
    82-002814
    82-002815
    82-002820
  Herbicides
    82-002806
  Hexachlorobenzene
    82-000408
  Hexachlorobiphenyl
    82-001876
    82-001877
  Hydrocarbons
    82-001093
  Industrial Wastes
    82-002800
  Insecticides
    82-000419
    82-001102
    82-001109
    82-001882
    82-001891
    82-002802
    82-002804
  Kepone
    82-002802
  Lead
    82-000392
    82-001938
    82-002787
  Manganese
    82-001875
  Mercury
    82-000409
    82-000412
    82-000417
    82-001095
    82-001098
    82-001881
    82-002788

...CONTINUED...
Pollution
  Mercury
    82-002801
    82-002812
    82-002813
    82-002820
  Mine Effluents
    82-002794
  Nickel
    82-001868
  Noise Pollution
    82-002809
  Ocean Dumping
    82-001879
    82-002817
  Oil
    82-000402
    82-001922
    82-002797
  Oil Spills
    82-000397
  Organochlorines
    82-001874
    82-002792
    82-002804
  Pesticides
    82-001869
  pH
    82-001104
  Pollution Abatement
    82-002811
  Pollution Avoidance
    82-000411
    82-001091
    82-001866
    82-001868
    82-002799
  Polychlorinated Biphenyls
    82-000405
    82-001873
    82-001885
    82-002790
    82-002804
    82-002816
    82-002818
  Power Plant Effluents
    82-000897
    82-001091
    82-001094
    82-001107
    82-001875
    82-002798
    82-002987
  Pulp Mill Effluents
    82-002789
  Radioactive Wastes
    82-002807
  Radionuclides
    82-001875
    82-001883
  Repopulation
    82-002822

SUBJECT INDEX

...CONTINUED...
Pollution
  Selenium
    82-002798
    82-002801
  Sewage Effluents
    82-000396
    82-000404
    82-000415
    82-000416
    82-001109
    82-001111
    82-002817
    82-002819
  Shipping Lanes
    82-002809
  Suspended Solids
    82-001105
  Taste and Odor Problems
    82-003025
  Terbutryn
    82-002806
  Thermal
    82-000393
    82-000399
    82-000407
    82-000820
    82-000893
    82-000897
    82-001092
    82-001094
    82-001108
    82-001865
    82-002914
  Thermal Pollution
    82-002799
  Thorium
    82-001883
  Titanium Plant Effluents
    82-001867
  Toxaphene
    82-001891
  Trace Materials/Techniques
    82-001870
  Trace Metals
    82-001903
  Treatment Plant Effluents
    82-001880
    82-002799
  Uranium
    82-001883
  Urban Runoff
    82-000414
  Zinc
    82-000410
    82-002787
    82-002803
Statistical Methods
  Age/Growth
    82-002579

...CONTINUED...
Statistical Methods
  Catch-Per-Unit-Effort
    82-002000
  Exploitation Rates
    82-001226
  Foods/Feeding/Selectivity
    82-001659
    82-001669
  Mortality Rates
    82-001745
  Population Studies
    82-000480
    82-001986
  Sampling
    82-000480
    82-001212
    82-001274
  Time-Series Intervention Analysis
    82-002004
Stocking/Introductions
  Egg Planting
    82-002939
  Exotic Species
    82-001196
    82-002941
  Forage Introductions
    82-000463
    82-000464
    82-000465
    82-000466
    82-000467
    82-000469
    82-000488
    82-001175
    82-001259
  General
    82-002944
    82-002945
  General/California
    82-001282
  Genetic Strains
    82-000517
    82-001194
    82-001198
    82-001203
    82-002017
    82-002871
    82-002943
  Hybrid Fish
    82-002995
  Management/Research--Lakes
    82-002942
  Management/Research--Ponds
    82-002997
  Management/Research--Reserviors
    82-002938
  Put-and-Take
    82-001195
    82-001197

# SUBJECT INDEX

...CONTINUED...

- Stocking/Introductions
  - Put-and-Take
    - 82-001201
    - 82-002938
  - Size at Release
    - 82-001202
    - 82-001981
  - Supplemental Stocking
    - 82-000517
    - 82-001199
  - Survival
    - 82-000462
    - 82-001194
    - 82-001199
    - 82-001203
    - 82-001980
    - 82-001981
    - 82-002937
    - 82-002940
    - 82-002942
  - Techniques
    - 82-000468
- Techniques
  - Acoustical Methods
    - 82-000498
    - 82-001190
    - 82-001274
    - 82-001641
    - 82-002044
    - 82-003032
    - 82-003034
  - Age/Growth
    - 82-000291
    - 82-000292
    - 82-000947
    - 82-000952
    - 82-000953
    - 82-000958
    - 82-001675
    - 82-001680
    - 82-001686
    - 82-001695
    - 82-001698
    - 82-002579
    - 82-002586
    - 82-002598
  - Computer Applications
    - 82-002110
    - 82-002586
    - 82-003035
  - Egg Collection
    - 82-000475
  - Egg Preservation
    - 82-003036
  - Feces Collection
    - 82-003027
  - Fish Counters
    - 82-002040
  - Fish Measurements
    - 82-003033

...CONTINUED...

- Techniques
  - Fish Preservation
    - 82-003026
    - 82-003029
    - 82-003031
  - Flow Regimes
    - 82-001273
    - 82-002014
  - Fluorescent Pigments
    - 82-001978
  - Foods/Feeding
    - 82-001650
    - 82-001653
    - 82-002542
    - 82-002551
  - Foods/Feeding/Selectivity
    - 82-001659
    - 82-001669
    - 82-002550
  - Ichthyoplankton
    - 82-001984
  - Marking/Tagging/Biological
    - 82-000460
  - Marking/Tagging/Fin Clipping
    - 82-002931
  - Marking/Tagging/Fluorescent Pigments
    - 82-002933
  - Marking/Tagging/General
    - 82-001189
    - 82-001973
    - 82-001975
  - Marking/Tagging/Individual Marking
    - 82-001191
  - Marking/Tagging/Misc. Tags
    - 82-001193
    - 82-002932
    - 82-002934
    - 82-002936
  - Marking/Tagging/Strontium
    - 82-001188
  - Marking/Tagging/Telemetry
    - 82-001192
    - 82-001974
    - 82-001979
  - Marking/Tagging/Wire Tags
    - 82-001976
    - 82-001977
    - 82-002935
  - Misc. Equipment/Cages
    - 82-003030
  - Misc. Equipment/Gasometers
    - 82-002039
  - Misc. Equipment/Stomach Samplers
    - 82-001653
  - Photography
    - 82-000501
    - 82-001191
    - 82-002038
    - 82-003033

...CONTINUED...
Techniques
  Photoperiod Control
    82-002041
  Population Studies
    82-000178
    82-000230
    82-000445
    82-001983
    82-002044
    82-002463
    82-002464
    82-002465
    82-003028
  Remote Sensing
    82-000499
  Sampling
    82-002021
  Scuba
    82-000813
    82-002476
  Sex Determination
    82-000569
    82-000570
  Surgical Apparatus
    82-002042
    82-002043
  Taxonomy
    82-001756
  Temperature Conversion
    82-000500
  Water Analysis Kits
    82-001272
Toxicology
  Acephate
    82-001147
  Acidification
    82-001908
  Acids
    82-001126
  Aluminum
    82-001892
    82-002859
  Ammonia
    82-000421
    82-000438
    82-001942
  Anesthetics
    82-000422
    82-000565
    82-001332
    82-001890
    82-001912
    82-001913
    82-001920
    82-002100
    82-002858
  Antimycin
    82-002870
  Aroclor
    82-001145
...CONTINUED...
Toxicology
  Aroclor
    82-001148
    82-001888
    82-001906
  Aroclor 1254
    82-001905
  Aromatic Hydrocarbons
    82-001134
    82-001941
    82-002861
    82-002865
  Arsenic
    82-000440
    82-001929
  Asbestos
    82-001115
  BAP
    82-001121
  Bayer 73
    82-001943
    82-002868
  Benzene
    82-001901
  Bioassay Techniques
    82-001114
    82-001116
    82-001469
    82-001893
    82-001930
    82-002004
    82-002824
    82-002835
  Bromate
    82-000436
  Cadmium
    82-000430
    82-001128
    82-001144
    82-001907
    82-001938
    82-002828
    82-002833
    82-002836
    82-002853
    82-002855
    82-002866
  Caffeine
    82-001898
  Carbamates
    82-000434
  Carbofuran
    82-001925
  Carcinogens
    82-000427
  Chlorinated Compounds
    82-000428
  Chlorinated Hydrocarbons
    82-000428
    82-002860
  Chlorine
    82-001464

...CONTINUED...
Toxicology
  Chromium
    82-001127
  Coal Conversion Effluents
    82-001114
    82-001900
  Complexing Agents
    82-001128
  Copper
    82-000205
    82-000423
    82-000442
    82-001126
    82-001897
    82-001904
    82-001909
    82-001923
    82-001937
    82-002826
    82-002830
    82-002833
    82-002850
    82-002855
  Cyanide
    82-001918
    82-002842
    82-002843
  Detergents
    82-002851
  Diflubenzuron
    82-002835
  Dimethoate
    82-002824
  Dimethylformamide
    82-001137
  DMBA
    82-001136
  Endosulfan
    82-000441
    82-001125
    82-001926
  Endrin
    82-001924
    82-002854
    82-002860
  Etomidate
    82-001890
    82-001920
  Fennosan F 50
    82-002862
  Flame Retardants
    82-001931
  Fluoride
    82-001330
  Formalin
    82-001899
  Formothion
    82-002856
  General
    82-000425

...CONTINUED...
Toxicology
  General
    82-002795
  Halogenated Hydrocarbons
    82-000433
  Heavy Metals
    82-000205
    82-000420
    82-000423
    82-000430
    82-000432
    82-000435
    82-000440
    82-000442
    82-001095
    82-001118
    82-001123
    82-001126
    82-001127
    82-001128
    82-001141
    82-001143
    82-001144
    82-001871
    82-001889
    82-001892
    82-001897
    82-001904
    82-001907
    82-001909
    82-001911
    82-001915
    82-001921
    82-001923
    82-001933
    82-001934
    82-001936
    82-001937
    82-001938
    82-001939
    82-002825
    82-002826
    82-002828
    82-002830
    82-002831
    82-002832
    82-002833
    82-002836
    82-002837
    82-002838
    82-002839
    82-002845
    82-002850
    82-002853
    82-002855
    82-002859
    82-002863
    82-002864
    82-002866
  Herbicides
    82-000429

...CONTINUED...
Toxicology
  Hexachlorobiphenyl
    82-001877
  Hydrazine
    82-000426
  Industrial Wastes
    82-000425
  Insecticides
    82-000428
    82-000434
    82-000441
    82-001124
    82-001125
    82-001138
    82-001142
    82-001147
    82-001148
    82-001149
    82-001150
    82-001891
    82-001906
    82-001910
    82-001924
    82-001926
    82-001932
    82-001935
    82-002823
    82-002824
    82-002835
    82-002852
    82-002854
    82-002856
    82-002860
  Iodine
    82-001919
  Iron
    82-001889
  Kepone
    82-001910
    82-002852
  Lead
    82-000432
    82-001938
    82-002832
    82-002837
    82-002864
  Lindane
    82-002823
  Matacil
    82-001142
    82-001149
  Mercury
    82-000435
    82-001095
    82-001118
    82-001141
    82-001871
    82-001933
    82-001934
...CONTINUED...
Toxicology
  Mercury
    82-002831
    82-002855
    82-002864
  Mirex
    82-000428
  MS-222
    82-000565
    82-001913
    82-002858
  Mutagens
    82-000427
  Naphthalene
    82-001134
    82-001901
    82-002829
  Nicotine
    82-002840
  Nitrate
    82-002834
  Nitrite
    82-001122
    82-001913
    82-002844
    82-002849
  Nitrogen Mustard
    82-000424
  Oil
    82-001121
    82-001129
    82-001139
    82-001140
    82-001905
    82-001914
    82-001922
    82-002797
  Oil Dispersants
    82-001927
    82-002847
  Oil Refinery Effluents
    82-001135
  Oil Shale Effluents
    82-001131
  Organochlorines
    82-001917
    82-002854
  Organophosphates
    82-001147
    82-001150
    82-001932
  Pentachlorophenate
    82-001130
  Permethrin
    82-001124
  pH
    82-000431
    82-001894
    82-001895
    82-001896
    82-001908

SUBJECT INDEX

...CONTINUED...
Toxicology
  pH
    82-001911
    82-001916
    82-002846
    82-002848
  Phenanthrene
    82-001140
  Phenols
    82-000437
    82-001117
    82-001120
    82-001866
  Phosphates
    82-000439
  Phosphoric Acid Triesters
    82-001931
  Piscicides
    82-000104
    82-000443
    82-001935
    82-001943
    82-002867
    82-002868
    82-002869
    82-002870
  Polychlorinated Biphenyls
    82-001145
    82-001148
    82-001888
    82-001905
    82-001906
    82-002827
  Pulp Mill Effluents
    82-001132
  Quinaldine
    82-002100
  Radionuclides
    82-002825
    82-002841
  Resin Acids
    82-001928
  Rotenone
    82-000443
    82-002867
    82-002870
  Silver
    82-002845
  Surfactants
    82-001133
    82-001146
  Temik
    82-000434
  Tetrachloroethylene
    82-001137
  TFM
    82-001943
  Thiodan
    82-001138

...CONTINUED...
Toxicology
  Thiourea
    82-000095
  Tin
    82-001940
  Titanium Plant Effluents
    82-001867
  Toluene
    82-001902
  Toxaphene
    82-000104
    82-001891
    82-001935
  Trace Metals
    82-001903
  Trimethylphosphate
    82-001119
  Vanadium
    82-001909
    82-002857
  Xenobiotics
    82-001916
  Zinc
    82-001123
    82-001143
    82-001915
    82-001921
    82-001939
    82-002825
    82-002833
    82-002839
    82-002863
  2-Phenoxyethanol
    82-000422
  2,4-D
    82-000429
Utilization of Fishery Products
  Archeological Sites
    82-000497
  Fish as Food
    82-002037
  Marketing
    82-000496
  Taste and Odor Problems
    82-001289
    82-003025
Water Use/Conservation
  Pumped Storage
    82-000452
    82-001172
    82-001350
    82-001954
    82-001959
    82-001961
    82-002996

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